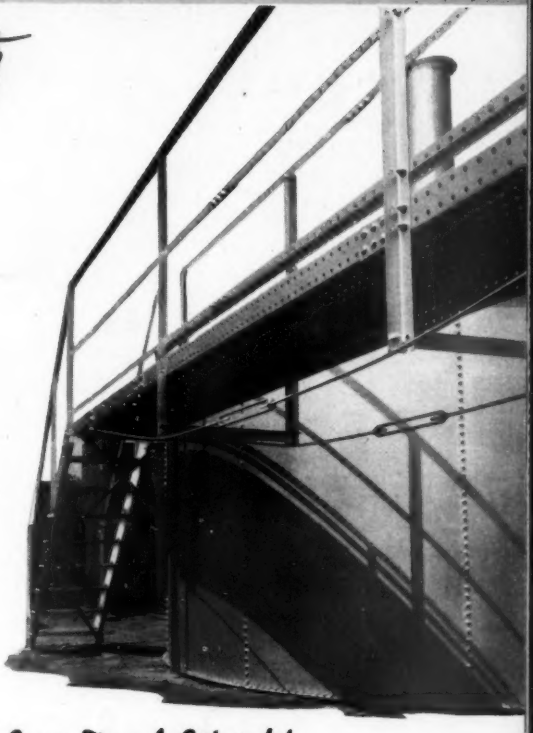
the OIL AND GAS JOURNAL

MALONEY STAIRWAYS AND WALKWAYS

Katy



- *Safety*
- *Convenience*
- *Durability*
- *Strength with Less Dead Weight*

These considerations label MALONEY STAIRWAYS and WALKWAYS as "on the beam" for your tank-battery, loading rack, or other needs. Cantilever type support does away with extra trusses, reducing weight and increasing rigidity.

MALONEY bolted construction enables easy, ready assembly, dismantling, moving or maintenance.

Burred surface steps and walks provide safe, non-skid footing. Standard sizes 26″ width in 4, 6 and 8 foot length sections—or, if you prefer, made to order.

Maloney Tank Mfg. Company · Tulsa, Oklahoma

MALONEY

Bolted and Welded Tanks • Pressure Vessels
Oil and Gas Separators

PRICE 20 CENTS DECEMBER 2, 1944

Holding 7,500 Pounds Pressure

Wyatt's

Backed by

MORE THAN A CENTURY OF VALVE "know-how"

WALWORTH CAST STEEL VALVES

Walworth Steel, Ball-Bearing Type Lubricated Plug Valve

Walworth Series 300 Steel Gate Valve

Walworth Series 600 Steel Globe Valve

Walworth Series 1500 Steel Gate Valve

Walworth Series 1500 Motor-operated Steel Gate Valve with Welding ends.

Since 1842, Walworth has continuously manufactured valves and fittings for every piping requirement. This unmatched background of experience in valve design and manufacture has given Walworth valves their outstanding reputation for dependability, economy, and long service life.

Walworth Cast Steel Valves — made in a complete line of types and sizes — are excellent modern examples of Walworth valve leadership. They combine the latest features of advanced valve design with the traditional manufacturing skill which has made Walworth valves famous throughout the world.

See your Walworth distributor for further information on Walworth steel valves, or write for a free copy of Catalog 42. It describes Walworth's complete line of valves and fittings in steel, bronze, and iron.

ARMY NAVY E

11 AWARDS TO 4 PLANTS

WALWORTH

valves AND fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

WALWORTH VALVES AND FITTINGS ESTABLISHED 1842

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

steady delivery

WITH TIMKEN BEARING EQUIPPED DRIVE

All shafts of the "Oilwell" D-12 Double Reduction Gear Drive used in connection with "Oilwell" TC-12C Pumping Units are mounted on Timken Tapered Roller Bearings.

This is much more than assurance of frictionless operation; it is a guarantee of full protection against radial, thrust and combined loads; of correct and constant shaft and gear alignment; of reduced power consumption; greater endurance; lower maintenance.

Oil field service imposes a severe test on bearings, but Timken Bearings have proved equal to every requirement in every kind of equipment in which they are used. Make sure *you* have them in the new machines you buy. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TAPERED ROLLER BEARINGS

Ten-ton tire

A typical example of B. F. Goodrich product development

A TIRE like this weighs only a *third* of a ton but can carry a *load* of *ten* tons, forty tons or more for four tires — nearly as much as a freight car. It is used for off-the-road hauling. It holds as much air as 25 auto tires, takes 20 minutes to inflate, costs $750.

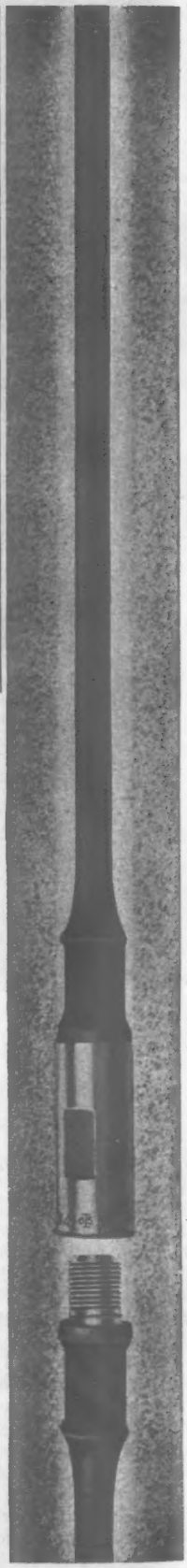
The Pennsylvania Turnpike, finished five years ago, might still be under construction if there were no big tires like this. Dams and airports now finished in 18 months would probably take four and five years to build. But even with all their advantages, costs were too high because these tires, running over big rocks, bruised too easily. Inner cords broke under sharp impact; tires had to be repaired or thrown away. Time and money were lost.

Then B. F. Goodrich men developed a new kind of "bruise-protected" tire. It has four extra layers of cords embedded under the rubber tread, and with a special kind of rubber between them. Under impact the cords distribute the force of the blow and allow it to be absorbed by the rubber.

Contractors tried the new tires. Some of the records were: 17,226 miles against 12,501 for the best of all three ordinary tires used; 15,017 miles compared to 11,304 for the best ordinary tire; 17,599 miles compared to 6,476 for the best ordinary type. There would be even more such records if military needs permitted more contractors to get these new tires.

B. F. Goodrich developments extend to every type of tire — passenger car, truck, airplane, farm, industrial, and the big off-the-road type. Whatever your tire need, if you buy B. F. Goodrich, you get tires backed by this policy of constant improvement.

B.F. Goodrich
Truck & Bus Tires



Want Lower Pumping Costs?

Large operators and independents find that, with Bethlehem Sucker Rods in their toughest wells, pumping costs take a decided drop. For Bethlehem Sucker Rods take depth, corrosion and crooked wells in stride. They have the strength and endurance to give long, dependable service with a minimum of down-time.

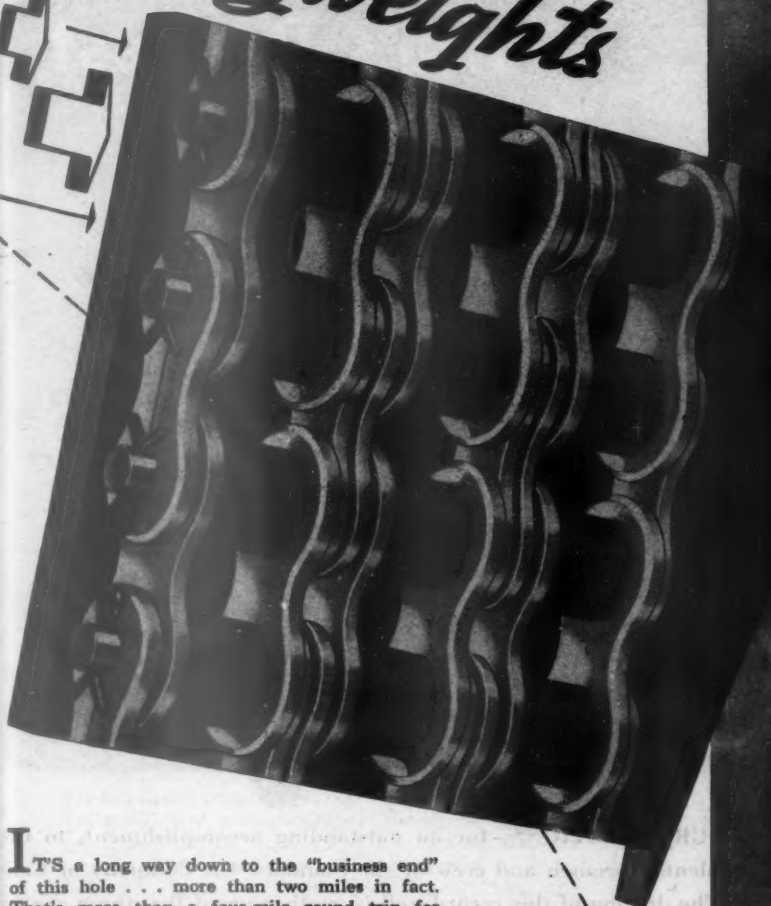
This is because every step in the manufacture of Bethlehem Sucker Rods is closely controlled, from iron ore to delivered rods, by an organization with years of experience in the manufacture of high-grade steels. This is your assurance of peak performance from every rod.

Bethlehem Sucker Rods are fully normalized for resistance to fatigue, and conform in every respect to A.P.I. specifications. They'll live up to your highest expectations.

Bethlehem Sucker Rods

★ ★ ★ BETHLEHEM STEEL ★ ★ ★

Pulling Power for Heavyweights



IT'S a long way down to the "business end" of this hole . . . more than two miles in fact. That's more than a four-mile round trip for nearly 100 tons of drill pipe, and calls for top-notch drives. On internal combustion power driven rigs like this one that usually means Link-Belt Silverlink Finished Steel Roller Chain on the drawworks drives. So well has this strong, flexible, accurately-finished all-steel chain performed under toughest-known drilling conditions in most fields of the world that it continues to widen its margin of popularity among the men who build, the men who buy, and the men who operate drilling rigs.

Silverlink is built to manufacturers' (A.S.A.) standard sizes in single and multiple widths to meet all drilling requirements . . . and is available at most supply stores.

LINK-BELT COMPANY

Builders of the Most Complete Line of Power Transmission Machinery
Indianapolis 6, Dallas 1, Houston 2, Los Angeles 33, Kansas City 6, Mo., New York 7, Toronto 8.
Distributors in all fields. 8027

LINK-BELT
THE SYMBOL OF QUALITY — LINK-BELT COMPANY
Silverlink
ROLLER CHAINS

The Oil and Gas Journal, published Saturdays by The Petroleum Publishing Co. Entered as second-class matter at post office at Tulsa, Okla., under act of March 3, 1879, U. S. and foreign rates to the petroleum industry, $6 yearly; 2 years, $10; 3 years, $12; 5 years, $15

VARCO Products used on World's Deepest Oil Well

View showing VARCO slips in use on world's deepest oil well located eleven miles east of Taft, California. Depth 15,800 Ft.

OUR CONGRATULATIONS—for an outstanding accomplishment, to the superintendents, foremen and crew of the Standard Oil Company of California. ★ The drilling of this record well is another proof that there are no limits to technical skill and ingenuity. ★ Not these men alone but the entire Oil Industry can be justly proud of this mighty performance of experts and equipment. ★ We were pleased to learn that the following standard "Varco" equipment is being used in drilling this well:

MASTER BUSHINGS—KELLY BUSHINGS
ROTARY DRILL PIPE SLIPS
HARDENED & GROUND SLUSH PUMP LINERS
PISTON RODS & WASH PIPES

Abegg and Reinhold Co., Ltd.

OFFICE AND FACTORY: 2533-2541 EAST 26TH STREET, LOS ANGELES 11, CALIFORNIA
GULF COAST OFFICE: 1502 MAURY STREET, HOUSTON 10, TEXAS
EXPORT OFFICE: 617 SOUTH OLIVE STREET, LOS ANGELES 14, CALIFORNIA

Now "DIESELS by HENDY" for the Maritime Commission

AV1 Cargo Ship

To the long list of Hendy products built for the Maritime Commission in the past few years is now added *Diesel generating sets*... of a *new* and *advanced* type. Coming off the production line in a steady stream, these 250-kw plants for the AV1 Cargo Ships are another example of Hendy's ability to design, produce and deliver—to combine precision workmanship with mass production.

The experience gained in building the engines for over one-third the entire Liberty Ship Fleet...the 4000-, 6000- and 8500-hp turbines and reduction gears for cargo and hospital ships... and turbo-generators of many types, made possible the remarkable delivery record of these Hendy Diesel generating plants.

Hendy Series 50 Diesels are available for industrial applications as prime movers, or with Crocker-Wheeler generators as a-c or d-c generating plants up to 450-kw in size. Orders are now being accepted for early deliveries. Write for complete information, stating your power requirements.

WRITE FOR DATA ON THE HENDY SERIES 50 DIESEL

375 to 675 hp

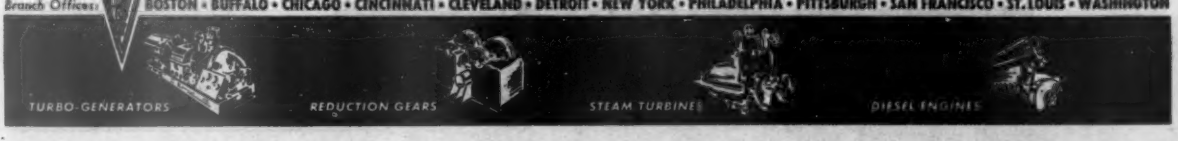
This modern Diesel offers 22 proved features in design never before available in a single engine. Direct-actuated dual valves, unit-type fuel injectors, overhead camshaft, hydraulic tappets and oil-cooled pistons are just a few of them. You, as a Diesel operator, will appreciate these and the others—for, combined, they are responsible for the high operating efficiency of Hendy Diesels. Catalog available on request.

JOSHUA **HENDY** IRON WORKS
ESTABLISHED 1856

SUNNYVALE, CALIFORNIA

71-D-11

Branch Offices: BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • ST. LOUIS • WASHINGTON



sure ice is O. K. in a high ball —

but NOT on a DERRICK FLOOR

Comes colder weather and there is an extremely bothersome and efficiency-reducing condition to complicate smooth operation on your derrick floor. Unless, of course, you solve this problem with the simple installation of PATTERSON-BALLAGH Pipe Wipers.

This wiper installed on your drill pipe "squeegees" mud, oil, and water from drill pipe coming out of the hole. This means cleaner drill pipe . . . no ice or slush to endanger the crew . . . dry gloves, dry shoes, no wet, cold hands or feet. Work is surer, faster, and more pleasant with this device that is now a "must" with most operators.

Cleaner drill pipe also permits better inspection and better grip for the tongs. Washed out tool joints are easily detected. Fishing can be confined to the legitimate pastime of catching fish.

For greater safety use the old wiper when "runing in." With smart operators, PATTERSON-BALLAGH Pipe Wipers and PATTERSON-BALLAGH Casing Protectors are standard equipment.

See Composite Catalog

PATTERSON-BALLAGH

Los Angeles 1 • Houston 10 • New York City 6

PATTERSON-BALLAGH PIPE WIPERS

Now Made of PBX Synthetic Rubber Oil and Weather Resistant.

THE LANDIS 3/8" THREADING MACHINE

...for Speed and Economy

Manufacturers of small parts find the 3/8" LANDIS (High Speed) Threading Machine ideal for handling their work. The high spindle speeds and simplicity of operation, with one lever controlling both the movements of the carriage and the opening of the grips, assure unusual production possibilities. The machine illustrated is producing over a thousand 5/16" diameter studs, 5/8" long, per hour. Several thousand threads are produced per grind of the chasers.

Write for Bulletin No. H-91

LANDIS MACHINE COMPANY, WAYNESBORO, PENNA, U.S.A.

THREAD CUTTING MACHINES • DIE HEADS • COLLAPSIBLE TAPS • THREAD GRINDERS

REPRESENTED IN THE DOMESTIC OIL FIELDS BY:

Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

For Dependable Power on the Job—
When and Where You Want It—

Specify CENTURY MOTORS and GENERATORS

Century Splash Proof Motor

Century Explosion Proof Motor

Century ARC Rotating Field Generator

Century Type SCT Splash Proof Pumping Unit Motors are engineered to assure continuous, economical pumping under the hazards of outdoor operation. They are scientifically "weather protected" against rain, snow, sleet, and ice.

These Century motors not only stand up under the toughest conditions, but, in addition, reduce wear and tear on equipment, keep operating costs low.

Such results are accomplished in two ways: — through unusually high torque with which to start a heavy load in cold weather; through exceptionally high slip which means that the motor speed pulls down when the load comes on. In slowing down against power peaks, the impact on equipment is cushioned; jolts and jars to machinery are reduced.

Century Explosion Proof Motors provide protection against varying degrees of explosion hazards—particularly for atmospheres containing explosive mixtures of gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, or natural gas. They are ideal for refinery and bulk station operation —protect life and property, reduce insurance costs, and assure continuous production—Underwriters' Laboratories approved for installation in Class 1 Group D hazards.

Century Type ARC Generators will do much to keep your pumping costs low—ideal for light and power where public service current is not available—use them also for standby equipment.

Consult your supply store or your Century Motor Specialist for complete information on all types and sizes of Century Motors and Generators for oil field use.

Century MOTORS

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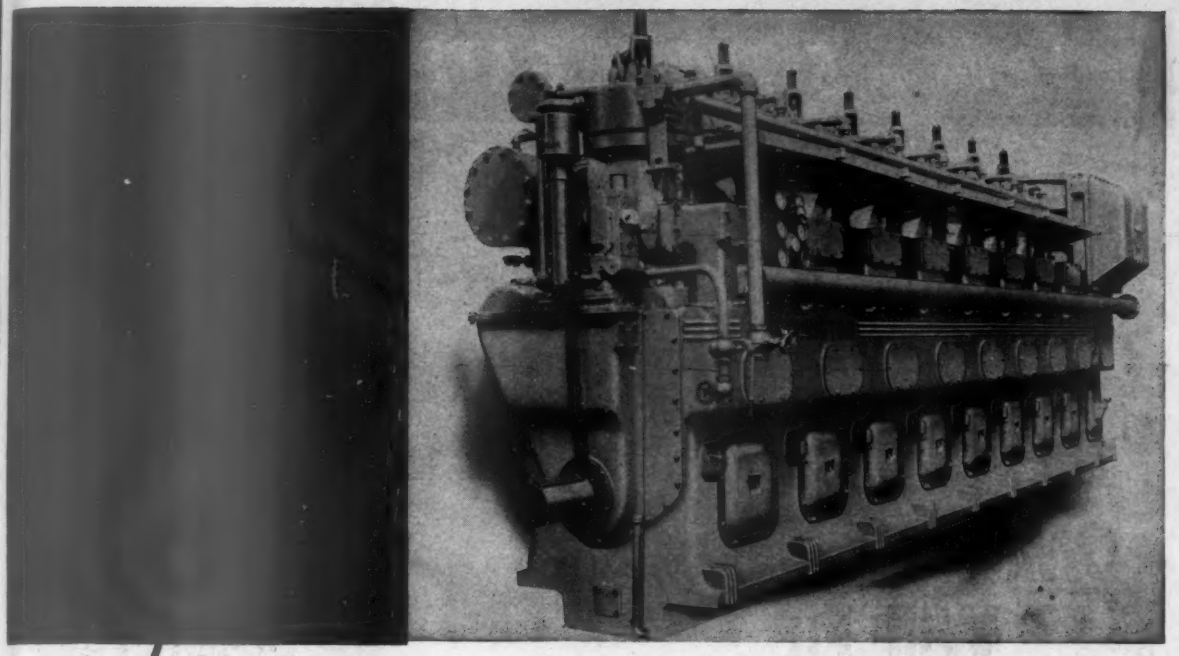
CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities



Here Are the Reasons Why Worthington Angles Are Specified for Leading Gas Pipelines Today

Heavy Construction

Ample masses of metal in correct structural relation . . . for strength, rigidity, maintained alignment, low maintenance, long life.

Straight-Line Design

Maximum accessibility for convenient and thorough inspection and simple adjustment . . . smooth power flow from equally spaced power impulses.

Single Scavenging Air Pump

Easily accessible for maintenance, with minimum piping for low-cost installation.

Cone-Type Cylinder Head

Bolt-loading on cold upper surface . . . no stress, eliminates costly repairs.

Cast-In Lube Oil Ducts

Cast-in passages for lube oil eliminate risk of pipe breakage . . . no joints or pipes to break or loosen.

Be sure you get all five!

Heavy construction is only one feature of Worthington LTC Angle Engine Compressors. From its rigid "backbone", the frame of the engine, to its cylinders, main bearings and shaft, a Worthington Angle *has the weight* in the right places.

Be sure you get all five!

Without any one of the 5 features listed here, you may not be getting the most from your engine-compressor investment. Write for complete details—in Bulletin L-690-B1. *Worthington Pump and Machinery Corporation, Harrison, N. J.*

WORTHINGTON BEHIND THE NAME WORTHINGTON

YOUR PARTNER IN POWER PROGRESS

GC 4-4

WORTHINGTON-BUILT AUXILIARIES

Evaporative Type Engine Water Cooler

Starting Air Compressors

Cooling Water Circulating Pumps

Oil Transfer Pumps

Diesel engines, 150 to 2,600 hp. . . . gas engines, 175 to 2,880 hp. . . . convertible fuel engines, 150 to 1,720 hp.

Here are 5 TYPES of GATES V-BELTS

ONE of these five types Will Fit Any Need You Have!

Whenever a drive in your plant is wearing out belts faster than it should—or is giving any other trouble—just *pick up your phone* and call the Gates Rubber Engineer.

He can quickly analyze your problem and, in most cases, he can correct the trouble very easily without needing to specify the use of any special-structure belts.

There *are* service conditions, however, under which a V-Belt of special construction can most profitably be used—and your Gates Rubber Engineer can then supply a Gates V-Belt that is precisely engineered to meet the unusual conditions.

The Gates V-Belt of special synthetic rubber is a notable example. As a result of specialized research, Gates developed this synthetic rubber V-Belt and began supplying it in large quantities to industry more than six years ago. Under severe conditions of heat and oil, this Gates special synthetic V-Belt actually outwears any natural rubber belt by as much as 230%.

In your particular application, V-Belts with tension members composed of flexible steel cables —or of rayon cords—may prove to be the most efficient and economical. Again, Gates Static-Safety V-Belts may best fit yur special need.

In any case, the wisest move you can make is to phone the Gates Rubber Engineer. (Just look under "Gates Rubber" in your phone book.) He will come right to your plant—will thoroughly analyze any drive problem you may have—and he will always recommend the practice that will be most efficient and economical for you.

4412

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

CHICAGO 6, **ILL.** 549 West Washington
NEW YORK CITY 3. 215-219 Fourth Avenue
ATLANTA 3 **GA.** 738 C & S National Bank Building
LOS ANGELES 21. **CAL.** 2240 East Washington Boulevard
DENVER 17. **COLO.** 999 South Broadway
DETROIT 4. **MICH.** 8663 Grand River Avenue
PORTLAND 9. **ORE.** 333 N. W 5th Avenue
DALLAS 1. **TEXAS** 1710 N Market Street
SAN FRANCISCO 3. **CAL.** 1090 Bryant Street

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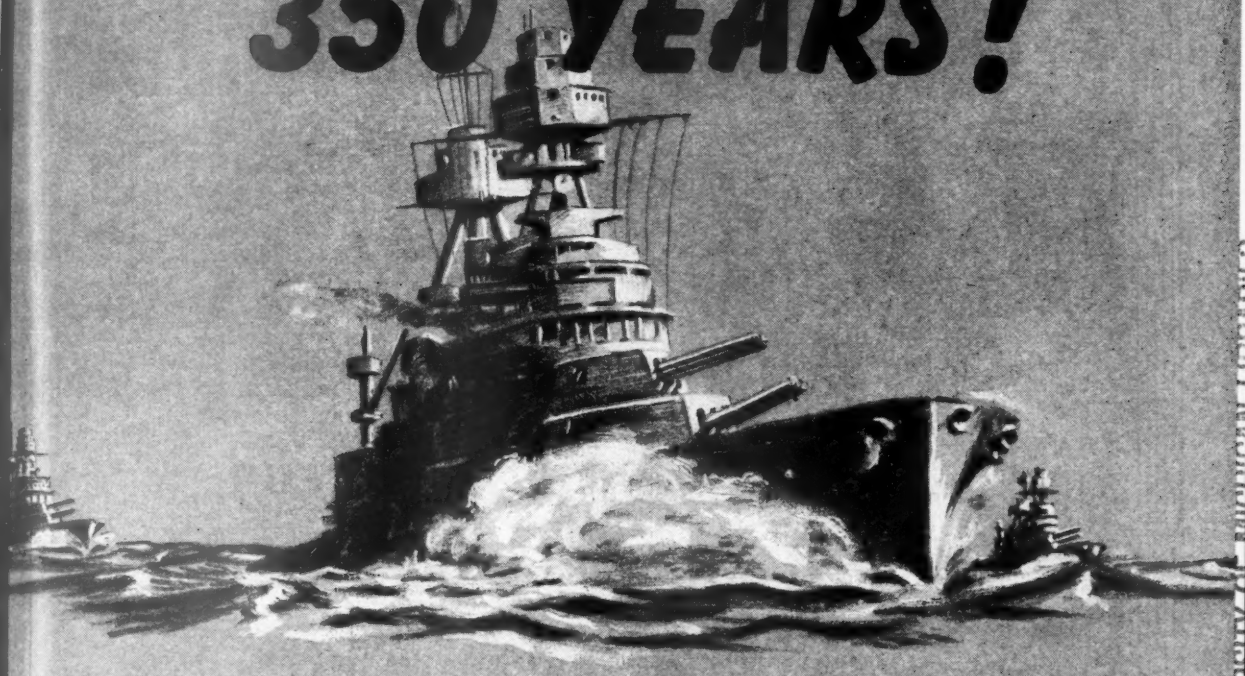
XL

ONE FUELING OF THIS SHIP WOULD

Heat Your Home 350 YEARS!



Never before have the products of a single industry played so important a part in winning a major war. Never before have the men of an industry performed so brilliantly in achieving the impossible. The fulfillment of staggering military requirements without curtailing essential civilian demands, and the transportation of millions of barrels of fuels and lubricants to far-flung points of use, must be recorded as one of the brightest pages in the book of American accomplishment. Our men are proud to have a place in that record — they made the pumps that power the portable lines that carry fuel to fighting fronts! . . . Gaso Pump & Burner Mfg. Co., 902 East First Street, Tulsa, Oklahoma. Export Office: 148 Broadway, New York. Shreveport: W. L. Sommer Co., 419 Lake Street. Los Angeles: Service Oil Field Supply Co., 5333 S. Riverside Drive.

GASO

FOR EVERY OIL INDUSTRY NEED

Pumps fuel to fighting fronts!

THE BLACK MARKET IS A PLAGUE that drains 2,500,000 gallons of gasoline a day from legitimate channels. It thrives on customers willing to sacrifice the nation's welfare to their own selfish convenience. Without such customers it would die overnight.

SAND—THE SABOTEUR

Keep it out of your oil wells!

SAND is nature's great abrasive. In a sand blasting machine it can do useful work. In an oil well it is a destroyer—cutting and wearing away the well, screen, tubing, pumps. It can exact a high cost in replacements, rework jobs and lower production.

The remedy is Texaco *Gravel Packing*. The gravel pack surrounding the well screen holds the producing sand in position, prevents clogging and wearing away of the screen, protects tubing, pumps and surface equipment against destructive sand abrasion and too frequent replacements.

Gravel Packing has paid dividends in lower costs and increased well production in a large number of wells in many different fields.

TEXACO DEVELOPMENT CORPORATION

A subsidiary of The Texas Company

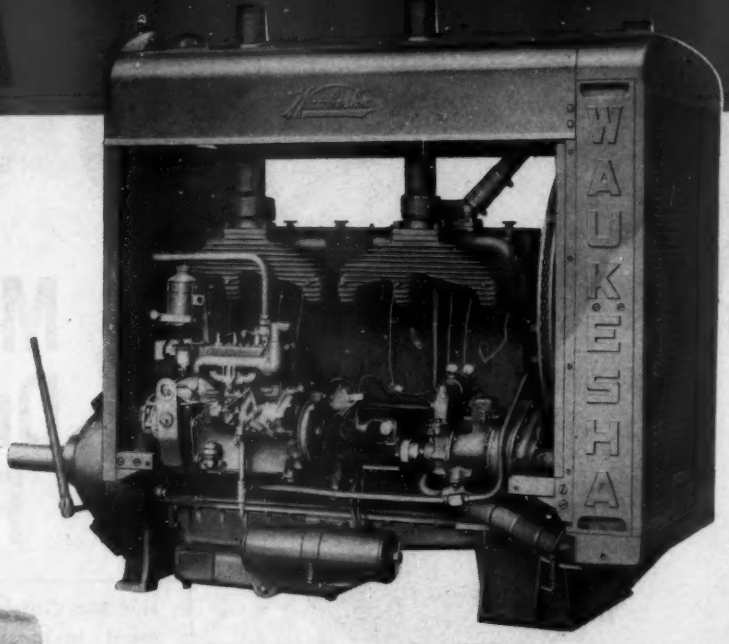
26 Journal Square • Jersey City, N. J.

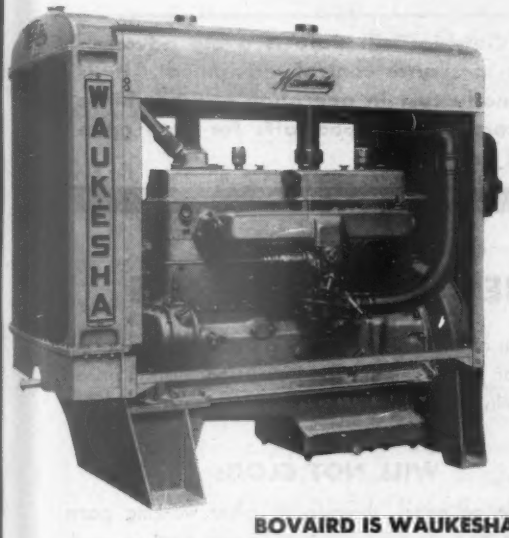
BOVAIRD has 'em, "as you like 'em"

WAUKESHA

DRILLING ENGINES

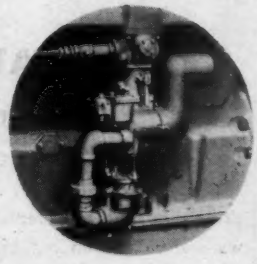
GAS OR GASOLINE





SUPER DUTY SIX

- This model WAK Gas or Gasoline Drilling Engine is rated at 193 Maximum HP at 1300 R.P.M.
- Popular in Multiple Engine Rigs.
- (Above) Often equipped with small gasoline starting engine to facilitate operation.
- (Left) Engine equipped with gasoline carburetor.
- (Circle) Combination gas and gasoline carburetor is extra equipment.



BOVAIRD IS WAUKESHA PARTS HEADQUARTERS FOR KANSAS

OFFICES AND STORES

ILLINOIS—Benton, Grayville, Salem
KANSAS—Chase, McPherson, Pratt, Russell, Wichita
OKLAHOMA—Oklahoma City, Sapulpa, Seminole
TEXAS—Borger, Pampa

NEXT TIME: *"Buy From Bovaird"*

SUPPLY BOVAIRD COMPANY

THE BOVAIRD SUPPLY CO.

GENERAL OFFICES: TULSA, OKLAHOMA

The worm gears that operate both the drill pipe packer and drill gate are shown with the housings removed. Also available with side outlets. Specify whether 2", 2½" or 3" is desired.

CLOSES IN 10 SECONDS!
SEALS TIGHTER AS PRESSURE INCREASES!
SAVES CELLAR SPACE!

THE MacCLATCHIE Drill Gate and Pipe Packer

The MacClatchie Drill Gate is a big advancement in pressure control equipment. It is exceptionally fast in operation and combines *in one compact unit* pack-offs for both open hole and drill pipe!

LOOK AT THESE MacCLATCHIE ADVANCEMENTS

OPERATES FASTER:

In field tests this Drill Gate has been closed in 10 seconds on open hole . . . and in 25 seconds around drill pipe. This exceptionally fast closing prevents wells from getting out of control.

SAVES CELLAR SPACE:

Two packing units are unitized into the single compact housing. Reduces over-all height . . . eliminates extra flanges and threads.

HAS QUICK CHANGE PACKERS:

When changing from one drill pipe size to another crews can often change rubbers in the drill pipe packer door in an hour's time. Rubbers are economically priced and available for all standard pipe sizes.

WILL NOT CLOG:

There are no gears, threads, or other working parts inside the body to become clogged with mud or sand. All gears are encased in oil bath housing.

IS POSITIVE ACTING:

Direct mechanical drive eliminates uncertainties of secondary operating mediums. It can't fail in emergencies.

Get all the information on the MacClatchie Drill Gate. Write today!

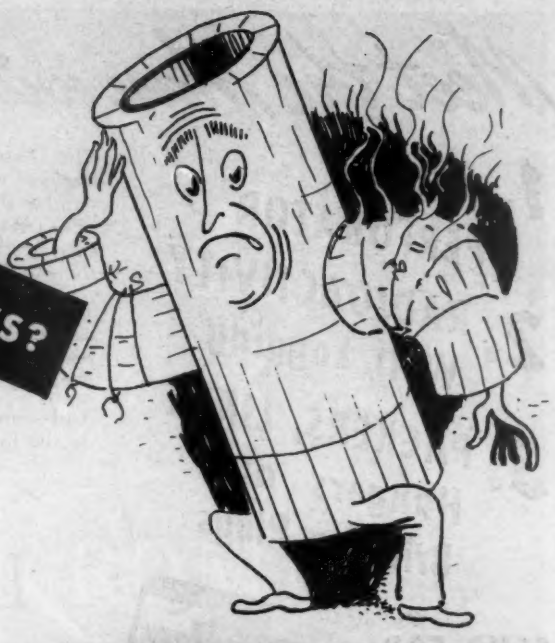
MacCLATCHIE MANUFACTURING COMPANY

COMPTON, CALIFORNIA

Mid-Continent Distributor: **HAKE TOOL COMPANY, Houston, Texas** • ***Rocky Mountain Representative:*** **MOUNTAIN SALES & SERVICE CO., Casper, Wyo.** • ***Foreign:*** **GEORGE R. WOODS, 17 Battery Place, New York City**

9974

COMING OUT AT THE ELBOWS?



SIMPLY APPLY UNIBESTOS
it's simple to apply!

Unibestos, being sectional for virtually all size pipes, greatly simplifies the application of insulation to bends and elbows. You simply mitre sectional Unibestos to fit—the fibrous nature of the material used in Unibestos (amosite) makes for a more perfect seal; eliminates much of the need for filling in with plastic —requires only a *surface* application to finish it off in a neat, clean and efficient job.

UNION ASBESTOS
MEANS PROGRESS IN INSULATION
AND RUBBER CO.

COPYRIGHT 1944
UNION ASBESTOS AND RUBBER CO

PLANTS: 1821 S. 54th Ave., CICERO, ILL. • PATERSON, N. J. • BLUE ISLAND, ILL.
OFFICES: CHICAGO • CICERO, ILL. • NEW YORK • SAN FRANCISCO • PATERSON, N. J.

Meet the Man with 50,000 Friends

1. GUN PERFORATOR

2. RADIOACTIVITY Well Logging

3. PACKERS, LINER Hangers and Bridging Plugs

The "Lane-Wells Man" *you* know is a member of a "Service Organization" whose primary purpose is to help you "get more oil" from your wells. As an "Operator" in a Lane-Wells gun perforator truck or—a Radioactivity Logging Unit the Lane-Wells Man understands this fact: *Your acceptance of him and the Services he renders will continue as long as he does his job effectively.*

That's why he follows your instructions implicity. That's why he uses every precaution to safeguard your crews, your property, and your interests. That's why he has won thousands of friends in America's oil fields in the past eleven years.

And—more important—that's why you can rely on Lane-Wells to do the job right.

SEND FOR BULLETINS

Complete details of all Lane-Wells Services and products are available through the Branch nearest you. Write today.

Tomorrow's Tools - Today

LANE WELLS COMPANY

Pioneers in Oil Field Electronics

LOS ANGELES • HOUSTON • OKLAHOMA CITY

General Offices, Export Office and Plant:
5610 So. Soto St., Los Angeles 11, California

24-HOUR SERVICE • 30 BRANCHES

Why Not Let Him Help You Too?

5 *big advantages of* PORUS-KROME*

1 PORUS-KROME applied to the cylinder walls of gasoline and Diesel engines multiplies the life of the cylinders from 4 to 20 times.

2 PORUS-KROME on the cylinder walls multiplies the life of the ordinary piston rings from 3 to 5 times.

3 PORUS-KROME, with its thousands of tiny pores and channels which hold lubricating oil and feed it back as needed, improves lubrication and holds lubricating oil consumption at a constant low level.

4 PORUS-KROME and piston rings wear so slowly that high power development is maintained for many more hours . . . many more miles . . . than with ordinary cylinders.

5 PORUS-KROME means greater engine reliability because it reduces scoring and scuffing and the risk of piston seizure and because it cuts down the number of overhauls caused by cylinder and ring wear.

All of these advantages add up to a substantial saving in engine operating costs.

VAN DER HORST

U. S. PATENTS 2,048,578 AND 2,314,804

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Good for the Life of your Engines

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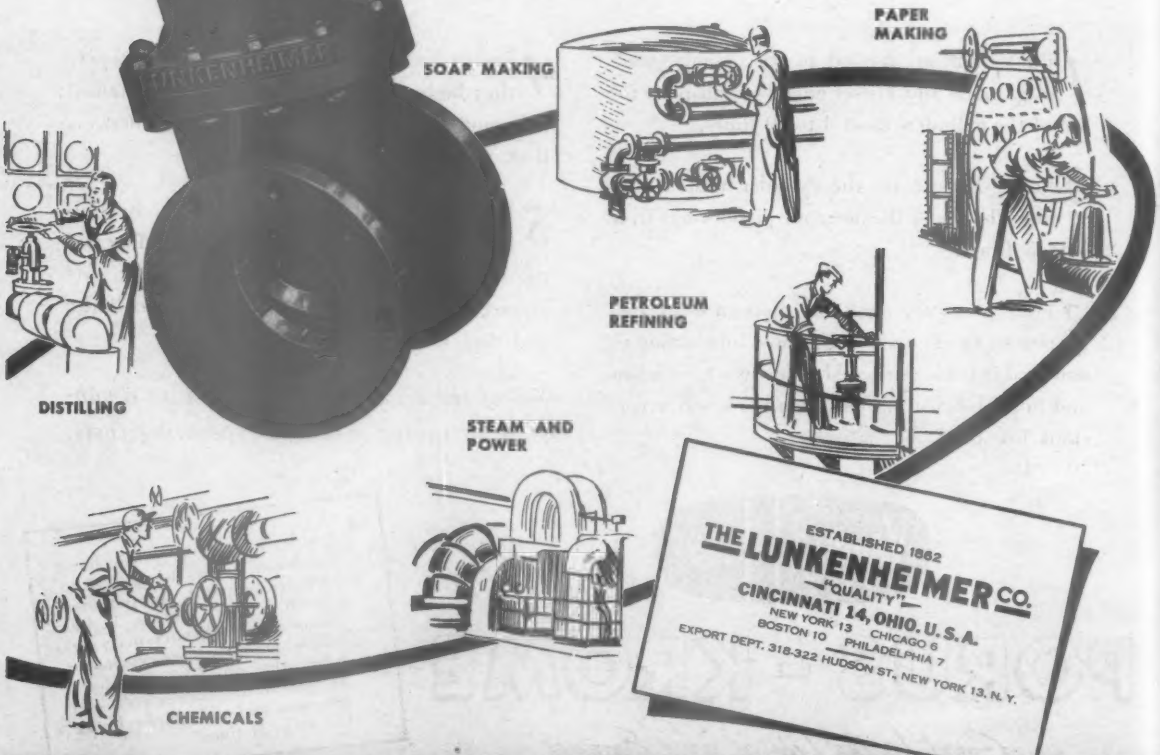

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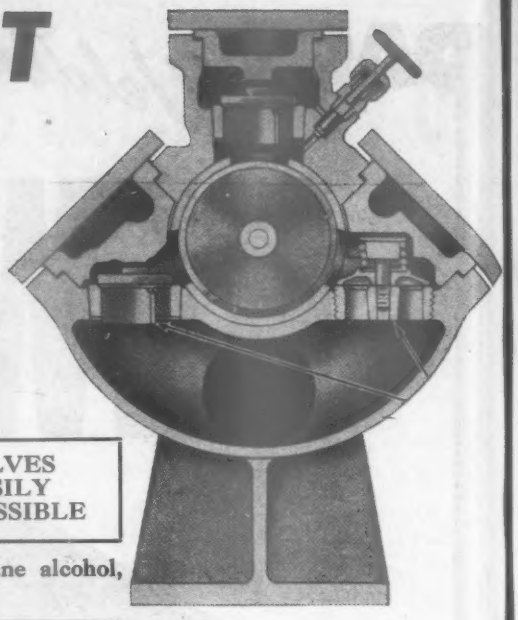

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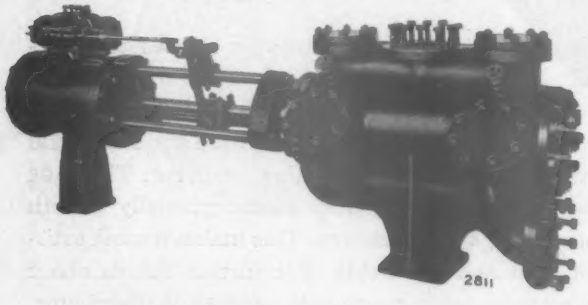

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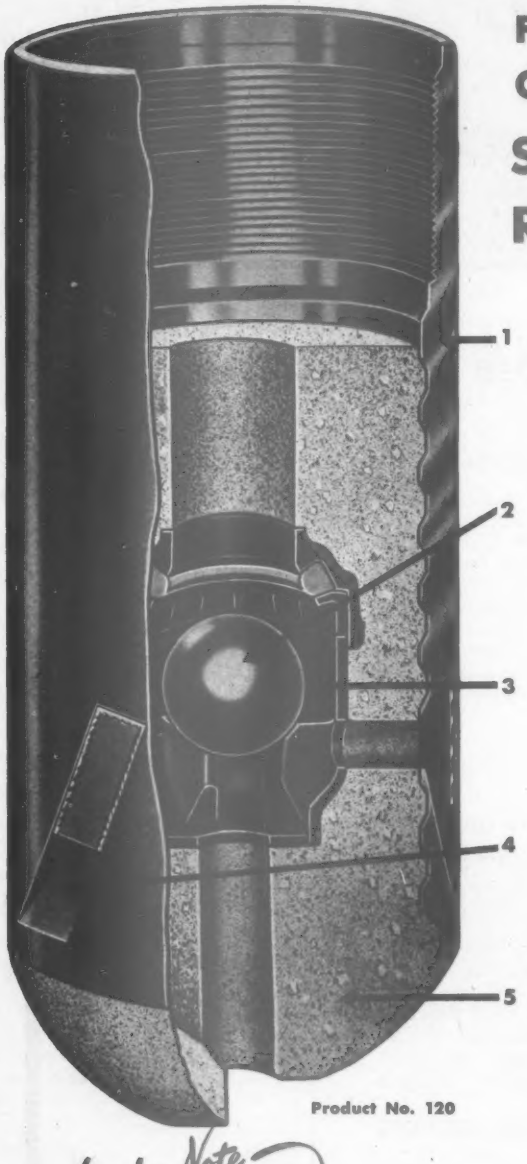
Study this BAKER Cement Wash Down WHIRLER FLOAT SHOE



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the OIL AND GAS JOURNAL

Trends

Crude-Oil Production
By States—Page 102

CRUDE-OIL STOCKS 221.431,000 bbl. as of November 18—down 1,036,000 bbl. One year ago 239,869,000 bbl.

GASOLINE STOCKS 78,741,000 bbl. as of November 18—up 650,000 bbl. One year ago 68,489,000 bbl.

RESIDUAL FUEL-OIL STOCKS 63,301,000 bbl. as of November 18—down 698,000 bbl. One year ago 62,-339,000 bbl.

GAS OIL AND DISTILLATE STOCKS 48,017,000 bbl. as of November 18—down 242,000 bbl. One year ago 45,297,000 bbl.

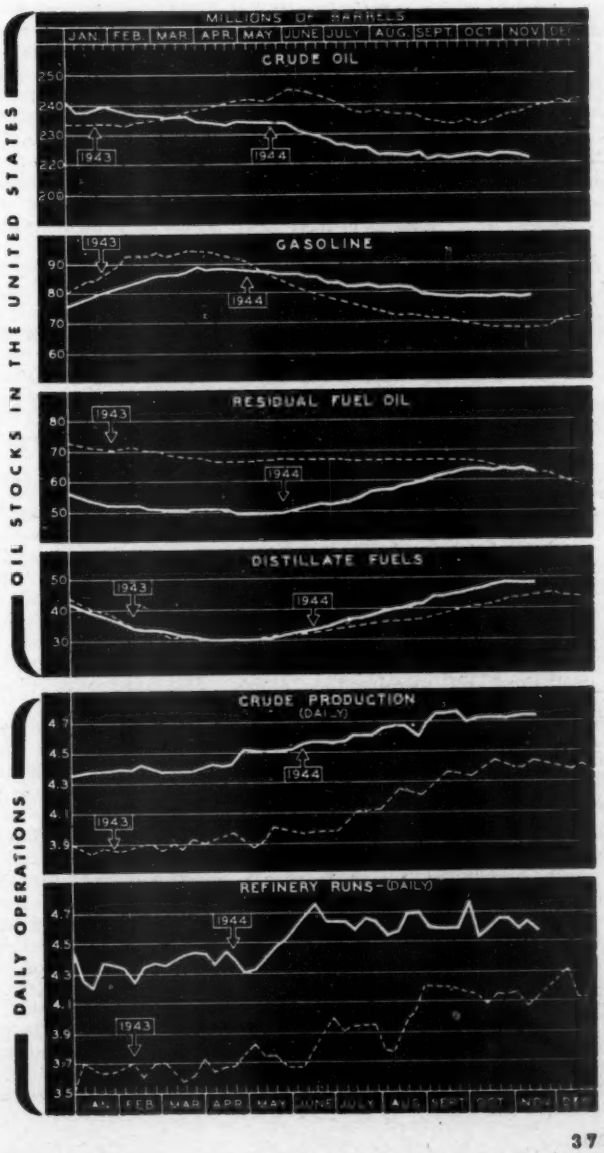
CRUDE-OIL PRODUCTION 4,734,000 bbl. as of November 25—down 2,300 bbl. Year ago 4,406,350 bbl.

REFINERY RUNS 4,567.000 bbl. daily week ended November 18—down 83,000 bbl. Year ago 4,212,000.

WASHINGTON reports indicate that the new Congress taking office in January will include a bloc which will renew efforts to promote the use of alcohols as substitutes for petroleum. Development of a major synthetic-rubber industry is a new factor in the "alcohol-petroleum" competition. In the early stages of the emergency rubber program preference was given to alcohol in the manufacture of butadiene, the principal component used in the manufacture of buna-S rubber. This was due to the immediate availability of alcohol and the fact that the plants to manufacture the butadiene could be built quickly.

IT was recognized by the Government's rubber agency that production of butadiene from refinery butylenes is a more economical method of operation and the construction of several plants was authorized. Most of these plants are now in operation, and their output of butadiene exceeds that of the alcohol plants. It is now conceded that the manufacture of synthetic rubber will be continued on a large scale after the war ends and government reports clearly show that the petroleum route is much cheaper than the alcohol method. Despite this situation agriculture interests and the communities in which the large synthetic plants are located are now urging the continuance of the subsidy arrangement on which the "rubber from alcohol" program is based.

PROPONENTS of alcohol as a substitute for gasoline also have plans for the future, according to national news commentators. These plans exist despite the fact that the fallacy of the alcohol program from the standpoint of cost and performance has been exposed numerous times over the past 10 years by investigators. In this connection a report of the Bureau of Standards this month is of interest. The bureau conducted an investigation into the use of alcohols as fuel in countries which do not have their own petroleum supplies. The following findings in regard to the performance of low-proof alcohol fuels are pertinent to the discussions in this country: "(1) The amounts of fuel used are so great that carburetor connections, jets, fuel lines, fuel pumps and tanks would have to be increased in size; (2) large amounts of water collect in the engine crank case; (3) spark plugs become moist and fail to fire at low throttle."



Minutes of Anglo-American Oil Agreement May Be Made Public

by Henry D. Ralph

WASHINGTON. — Minutes of the Anglo-American discussions which preceded signing the petroleum agreement may be made public or submitted to the Petroleum Industry War Council by the State Department in an effort to win the council's approval of the agreement in its present form or with only minor reservations.

It is understood that these minutes reveal that the fears of domestic control now being raised by the American oil industry were anticipated during the negotiations and it was made clear that no such power was contemplated. It is said that the position of the American delegates and the acceptance of this interpretation by the British, as set forth in the minutes, would remove most, if not all, of the industry's objections to the agreement.

Several government officials interested in the agreement have been seeking to make public these minutes now, anticipating they would be incorporated in the public record of the Senate committee on foreign relations as soon as consideration of the agreement begins at the capitol, but that the State Department has withheld them in deference to British wishes. However, a recently published British white paper contains excerpts from these minutes dealing with Britain's position on foreign exchange, and this fact may induce the State Department to lift the ban of secrecy in the very near future.

The national oil policy committee of the council meets in Washington December 2 and probably will remain in almost continuous session until the PIWC meeting the following Wednesday. It was instructed at the last meeting to recommend specific changes in language of the treaty which would remove objections of the industry without destroying the objectives of the agreement. Government officials are extremely hopeful that PIWC will reach agreement on such recommendation at the December 6 meeting in order that changes may be discussed with the British before the treaty is scheduled to come up for consideration in the Senate, probably late in January.

During the past month the committee has been polling its membership for suggestions and these have been compiled and compared for use of the committee at its coming session. It is understood that these suggestions, for the most part, still take the form of general opposition to the agreement rather than offering many practical suggestions for minor reservations. In view of this and because of the increasing number of resolutions against the treaty being adopted by oil industry groups, government officials may conclude that full disclosure of the entire negotiations provides the only hope of obtaining industry support for a treaty without emasculating reservations.

The administration's determination to press for ratification of the oil treaty will not be lessened by the resignation of Cordell Hull as secretary of state, because Edward R. Stettinius, Jr., who has been nominated to succeed him, participated in the negotiations and signed the agreement in his capacity of under secretary.

However, a united industry opposition would have a very considerable effect on the attitude of many members of the Senate when the treaty comes up for ratification, so the administration can be expected to take every possible step to prevent the PIWC from condemning the pact unreservedly.

Excerpt Not Very Revealing

The excerpt from the minutes disclosed by the British white paper was not very revealing in itself. It expressed the British desire to continue the imperial preference system by importing oil from empire sources if necessary to protect England's foreign exchange position. The Americans objected to this and it was agreed that if such problems arise they should be submitted to the International Petroleum Commission and if this body cannot find a solution the only recourse of the British would be to ask a suspension or termination of the agreement.

The British press has been highly critical of the agreement and this factor is believed to be contributing to early disclosure of further details. Many of the objections raised by American oil men over ambiguity of the language are adopted in the British criticism.

At the last meeting of PIWC, Harold L. Ickes, as petroleum administrator, urged the group not to condemn the agreement without studying it. He asked the men to forward positive recommendations for sections they did not like, with an eye toward improving them rather than taking a completely negative attitude.

PIWC referred the question to the national oil policy committee, which in turn engaged Judge Hudson to study the agreement and translate it for them into terms of oil operations.

Hudson is now completing his findings and they will be the basis of the policy committee report to PIWC on December 6. The report has been kept secret so far.

It is known that Hudson, at 58, has spent most of his life studying international law in all fields, and is sympathetic to international cooperation among nations. Whether this will carry over into oil matters is something that won't be known until his report is made public.

Aviation-Fuel Output of 650,000 Bbl. Daily Predicted

LOS ANGELES.—Dr. Gustav Egloff, director of research for Universal Oil Products Co., Chicago, reported here this week to the Los Angeles section, American Chemical Society, that production of 100-octane-plus gasoline by end of 1945 will equal 15 per cent of domestic crude-oil withdrawals. If the petroleum production rate is sustained at 5,000,000 bbl. daily, the anticipated output of military aviation fuel would be approximately 650,000 bbl. a day. Production rates in July were 500,000 bbl. daily, Dr. Egloff said, equal to 11 per cent of the crude-oil output.

Chemicals produced from petroleum hydrocarbons this year, Dr. Egloff reported, will equal less than 1 per cent of volume by weight of crude-oil output. He estimated 1940 output of chemicals from coal tar at 800,000 tons and from petroleum and other noncoal materials at 1,800,000 tons.

Work Rushed on Tankers Named for Oil Fields

SAN FRANCISCO. — The tanker McKittrick Hills, one of a series of 32 powerful oil-carrying ships named for important California oil fields, was launched by Marinship Corp. at Sausalto, on San Francisco Bay, November 26. This high-speed tanker was the tenth of the series to be launched. The Baldwin Hills was launched a week earlier. The Newhall Hills is being rushed to completion, and it is expected to glide into the bay within 10 days. Keel for the Midway Hills was laid November 20.

Demand Misconception Cause of Current Residual Maladjustments

by H. Stanley Norman

NEW YORK.—Current maladjustments in the residual fuel-oil situation which are forcing significant corrective measures in the East Coast refining and distributing system are the outgrowth of the misconception of future demand. This is the consensus of top operating men in government agencies and private industry who have virtually commuted between New York and Washington during the past few weeks seeking a solution to the problem which threatens to interfere with production of war materials at eastern refineries.

There is no basic oversupply of residual fuel but it happens to be contained at the wrong places. Refiners' tanks on the East Coast are filled; practically the same situation exists on the Gulf Coast. If current rates of operation are maintained, which is essential if the industry is to continue current production of war materials, additional residual fuel oil is added to the refiners' storage.

The trouble rests exclusively in the distribution and marketing conditions. Consumers are normally well fortified for winter requirements by this season of the year and total stocks, consequently, represent an even distribution of the supply throughout the distribution system of the nation. Currently, however, operators of bulk terminals and large industrial consumers are virtually living on a "hand-to-mouth" basis, anticipating that any change in the European war would bring an automatic depression of residual fuel-oil prices. The reluctance to purchase more liberally sifts from the operators of large bulk terminals, many of which in the East Coast area are capable of handling thousands of barrels, down through the large and small industrial consumers, big apartment and office buildings and on to the less important customers.

With residual stocks chiefly concentrated in the hands of refiners, the operating problem must take one of at least two logical courses. Normally, the solution would be found in reducing runs of crude oil to stills, allowing the reserve stocks to make up the operating deficits created thereby in gasoline, distillate fuel, and other products. Now, however, the only logical relief appears to be in exercising more selectivity in the types of crude run to refineries. Operations, therefore, are being concentrated on crude oils yielding the lowest percentage of heavy fuel, maintaining the production of war products at maximum levels.

Wide Disparity in Locations

Total residual oil of 63,301,000 bbl. reported November 18 by American Petroleum Institute are not exorbitantly higher than on the comparable date in 1943 but closer scrutiny by those to whom more detailed data are available shows wide disparity in where the stocks were located a year ago compared to the present. Bulk treminals, for example, a year ago contained 20 to 50 per cent more residual oil than now.

First effect of the changing program on the East Coast is to reduce runs of heavy crude produced in the Lake Maracaibo district of western Venezuela. Production in that part of the country has been reduced 32,000 bbl. per day and a similar cut may be enforced in the eastern part of Venezuela until the current crisis in residual fuel oil is corrected. Development of the winter season naturally is working to the advantage of refiners for the reason that temperatures limit the extent to which buyers may delay attention to their storage.

Consideration must be given also to the inability of delivery services to function on short notice on the bays and inlets and over the highways along the East Coast, particularly in the New England states and upstate New York.

While the current trend is to deemphasize producing operations in Venezuela, efforts are being applied just as strongly to lift the output of Colombia, Peru, and Ecuador. Producing countries in the western part of South America will occupy a favored position in supplying the rising demands for petroleum in the Pacific theater of military operations.

Colombia, of course, with its more substantial production and more extensive development, will be featured. Movements of Colombian crude oil, it is reported, have been started to the western coast of North America and will be increased substantially by the middle of 1945. South American petroleum shipments to the West Coast of North America may rise to 45,000 bbl. per day by the middle or latter part of 1945 in order to supplement California's anticipated maximum production and overland shipments from Southwestern and Rocky Mountain fields of the United States.

Military Demands for Gasoline Increase 433 Per Cent Since 1941

WASHINGTON. — Military demands for all types of gasoline have increased from approximately 150,000 bbl. a day in 1941 to more than 800,000 bbl. daily in 1944 — a jump of 433 per cent, Petroleum Administrator for War Harold L. Ickes said November 28.

Discussing the civilian supply situation, Administrator Ickes cited the tremendous increase in military requirements as the reason the total quantity of gasoline available for civilian passenger cars today is but 36 per cent of the quantity available in 1941.

"Military demands for gasoline," he said, "have increased 650,000 bbl. a day, or 433 per cent over 1941 requirements. In addition, military demands for other petroleum products bring the total military petroleum requirements that must be supplied from the United States to 1,600,000 bbl. daily. To cope with this increase we have increased crude-oil production to the fullest degree.

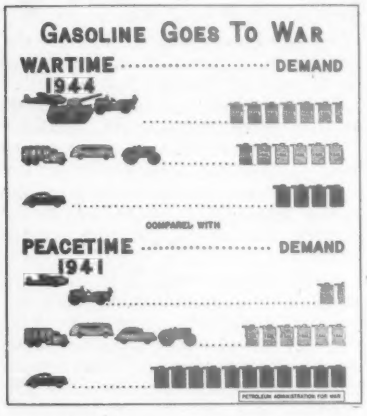
"In fact, we have at times been forced to certify to oil-producing states monthly production rates considered to be in excess of the maximum rate of production that can be sustained for any extended period."

Deputy Petroleum Administrator Ralph K. Davies said that since 1941 the United States petroleum industry has increased crude-oil production and refinery runs more than 20 per cent—approximately 900,000 bbl. a day—to more than 4,700,000 bbl. a day in November 1944.

"Even though we have stepped up refinery output, military requirements have increased at an even faster rate," Davies said, "so that there has been less gasoline available for civilians than might otherwise be expected. During October 1944, for example, refineries made

only 1,257,500 bbl. a day of civilian-grade gasoline, while some 1,875,000 bbl. a day of similar grades of gasoline were made during the same period in 1941 when military demands were relatively low."

Stocks of civilian-grade motor fuel declined from 40,192,000 bbl. on September 30 to 39,462,000 on November 4, 1944, Davies said. Civilian stocks on November 1, 1941, were 67,360,000 bbl.



"The primary assignment of the Petroleum Administration for War is to make available for the military all of the petroleum needed and at the time and place it is needed," Davies said. "To date, we have been able to meet all military combat requirements, and with our improved facilities—as new refineries and pipe lines and other improved transportation facilities — we expect to be able to continue to do so until final victory is ours.

"So long as the war in Germany continues, PAW will do well to meet the full military requirements and essential civilian needs. There will be no margin for relaxation."

The latest figures on production and stocks of civilian grade motor gasoline follow:

District—	Refinery production (bbl. daily) Sept. 30 to Nov. 4	Sept. 30	Stocks (bbl.) Nov. 4
1 (E. Coast) ..	179,400	7,018,000	7,409,000
2 (Mid. West).	468,000	16,856,000	16,726,000
3 (S.W.)	402,600	11,246,000	10,295,000
4 (Rky. Mts.) .	41,600	1,186,000	1,052,000
5 (Pac. Coast).	165,900	3,886,000	3,980,000
Total U. S. .	1,257,500	40,192,000	39,462,000

Coordinators Appointed to Promote Fuel Efficiency

WASHINGTON.—Industrial fuels —burner oil, gas and coal—will become "increasingly critical until the enemy in all theaters of the war is vanquished," Harold L. Ickes, secretary of the interior, warned in appointing 39 additional coordinators who will serve without pay to help promote the national fuel efficiency program sponsored by the Government in cooperation with industry. The new coordinators, said Ickes, are joining other coordinators, regional engineers, waste chasers, and similar volunteers to help combat waste and promote more effective utilization of fuels.

Although the Department of the Interior, through the Bureau of Mines, plans the over-all program, the field work is performed by citizens who form the volunteer corps of more than 170 coordinators, 5,000 regional engineers, and 3,500 waste chasers throughout the nation. The objective of the program is to locate sources of heat loss in the production, transmission and utilization of heat energy and to take immediate steps to prevent further waste. According to Bureau of Mines fuel-efficiency experts, there may be many "bad spots," visible or invisible, in a single plant. The fuel-efficiency program seeks to eliminate such elements in each installation so that operating costs will be lower and less fuel required.

Federal Land in Louisiana Available for Oil Tests

WINNFIELD, La.—Almost 100,000 acres of land in Winn, Grand, Natchitoches, Rapides and Vernon parishes, owned by the federal Government, is now available for oil and gas exploration, according to officials of the Kisatchie National Forest. The land was bought, largely in 1933 and 1934, by the Government from private owners, who retained mineral rights for a 10-year period. These rights now have reverted to the Government, and with a view to encouraging oil and gas development, liberal leasing terms are offered to oil operators willing to do wildcat drilling.

Discovery of commercial production would benefit all the parishes in which national forest lands are located. The parishes in which the Kisatchie forest has lands, receive 25 per cent of all gross revenues derived from these lands, whether it be timber, oil, gas or other natural resources. The total annual income from all the lands in the various parishes is pooled, and then prorated to each parish on the basis of the number of acres of Kisatchie forest land in each parish.

Police juries and parish school boards of the parishes in which there are Kisatchie lands, are now receiving substantial revenues from the sale of timber.

Ohio Oil Increases Price

FINDLAY, Ohio.—The Ohio Oil Co. has increased its posted price for Lance Creek, Wyo., crude oil 13 cents a barrel, to $1.25. The new price is effective November 24.

Derby Oil & Refining and Subsidiary to Merge

WICHITA, Kans. — Derby Oil & Refining Corp. has called a meeting of stockholders for December 12 to act on a plan to merge the company into its operating subsidiary, Derby Oil Co.

Under the plan the capital structure of Derby Oil Co., the surviving company, will be revised to provide a total authorized stock of 500,000 shares, no par, which are to be issued in exchange for outstanding shares of Derby Oil & Refining Co., on a share-for-share basis.

In a letter to stockholders, H. E. Zoller, president, says the present corporate set-up is costly and complicated, resulting in a duplication of expenses, income taxes, etc.

Kendall Refinery Men Get Safe-Driving Awards

BRADFORD, Pa.—Fifteen drivers for Kendall Refining Co. last week received Safe-Driving Awards from National Safety Council. The production department set up a perfect record, having finished a year's driving without an accident. J. B. Fisher, president, presented the awards. Top honor went to Elmer Jarrett, of the production department, who has been driving company cars without an accident for 10 years.

For the second successive year Kendall has received special recognition from National Safety Council for winning third place with a perfect record in the national passenger car fleet contest.

Postwar Spending Survey Shows New Cars in Lead

NEW YORK.—It will be automobiles, electrical appliances and radios — in that order — when employes of the Socony-Vacuum Oil Co., Inc., send their postwar dollars to market.

Automobiles will be among the first purchases for 762 employes, or 42 per cent of the men and women who responded to a questionnaire on postwar buying. Electrical appliances, consisting of toasters, irons, shavers, mixers, etc., are second choice, with 622. Radios will be first purchases for 610 employes.

The question, "What are the first products you plan to purchase after the war," was asked of 3,000 Socony-Vacuum employes at the company's headquarters, 26 Broadway, the New York City division, 230 Park Avenue, and the Queens County refinery. Responses were received from 60 per cent, or 1,803 men and women representing executives, department managers, secretaries, clerks, salesmen, refinery workers and truck drivers.

THIS WEEK

PRODUCTION—Salvage and plugging started in St. Louis area, Oklahoma. . . . Had its spectacular day in Greater Seminole group of fields. . . . Hundreds of wells shut down. . . . ¶Governor Kerr to recommend law looking to repressuring of Oklahoma City field. . . . Expected to stir hot fight in legislature. . . . ¶Country's daily production down 2,300 bbl., at 4,734,000. . . . ¶Daily average production of West Edmond pool, Oklahoma, doubles in 3 months. . . . "Good flow" of high-gravity oil apparently has converted Gwinnville gas field into Mississippi's newest oil field. . . .

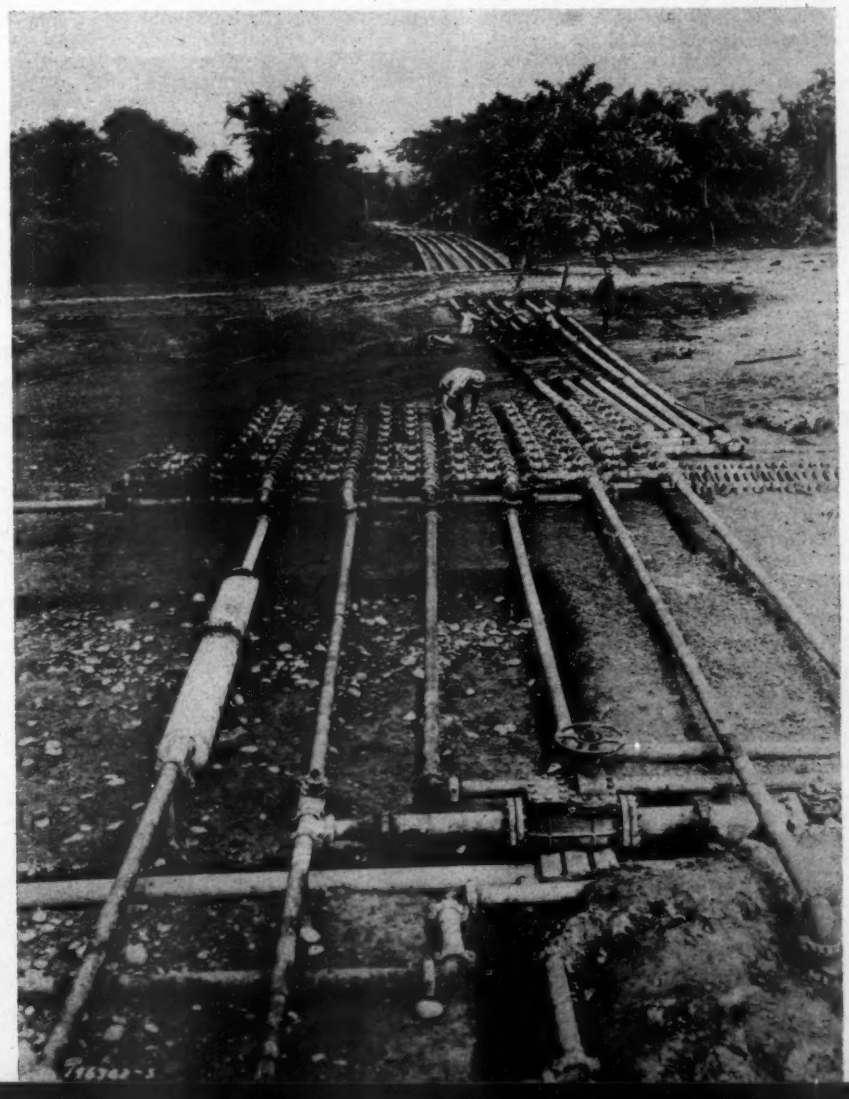
TREATY—Minutes of Anglo-American conference likely to be made public, to clear atmosphere. . . . Full, frank disclosure of Washington negotiations expected to remove much concern about control of industry. . . . ¶Fate of pact in Senate may depend largely on report of Judge Manley O. Hudson, authority on international law, engaged to study it. . . . ¶Governor Stevenson, Texas, latest to add protesting voice. . . . Says pact would rob state of control of its oil business, turning it over to international management. . . .

DRILLING—Deepest test in East Texas area to be drilled. . . . Contracted to 13,000 ft., or 300 ft. in Smackover, if present. . . . First Smackover test for East Texas basin. . . . ¶Kansas producers urge relaxation of 1-to-40 spacing regulation, to permit drilling on 20-acre units. . . . Declare restriction makes it impossible to maintain production of 275,000 bbl. daily. . . . ¶Veteran Wichita Falls operator drills wildcat in back yard and opens new Caddo pool. . . . ¶After being out of control 2 years, burning well in Bammel field, Texas, is killed. . . . Cratered 10 acres. . . Week's completions total 526, compared with 575. . . . ¶Continental Oil Co. discovers new field in Goliad County, Texas. . . .

FOREIGN—Ickes, in magazine article, expresses belief Arabian pipe-line project, "done to death" by opponents, will be carried out eventually. . . . Scouts assertion that it would put Government in the oil business. . . . ¶Lend-lease report reveals American air forces in China-Burma-India theater had received by June 30, 1944, 113,300,000 gal. of aviation gasoline, drawn chiefly from British oil sources, mainly Middle East. . . . Also got 31,000,000 gal. of motor gasoline besides millions of gallons of oil, lubricants and grease. . . . ¶Texas refuses to waive hearings on proposed pipe line to move gas from that state to Monterrey, Mexico. . . .

MARKETING—OPA says gasoline black markets "fairly under control." . . . Fines and imprisonment take place of scoldings and cautions. . . . ¶Leaders in British and American cooperative movement visiting refineries here. . . . Plan international association, which may play important role in oil-refining business. . . .

U.S. Signal Corps Photo from Acme



Intricate manifolding indicates the complexity of operating the new military pipe line connecting India with China. The section shown here is "somewhere in Burma". The U. S. Army's 775th Engineer Petroleum Distribution Company built the line, enlisting some of the petroleum industry's most talented pipe-line technicians for executive officers

Reverse Lend-Lease in Petroleum Products Mounting

WASHINGTON. — Mounting reverse lend-lease in petroleum products and related war equipment was revealed last week in the seventeenth lend-lease report and a British white paper released simultaneously in Washington.

In the China-Burma-India theater, the American air forces had received, by June 30, 1944, 113,300,000 gal. of aviation gasoline and 31,000,000 gal. of motor-vehicle gasoline, besides additional millions of gallons of oil, lubricants and greases. These supplies, the lend-lease report pointed out, were drawn from British oil resources, principally in the Middle East.

A large part of the aviation gasoline for B-29 Superfortresses of the Twentieth Air Force came, through reverse lend-lease, from the British refinery at Abadan, on the Persian Gulf. The medium and heavy bombers and fighters of the Tenth U. S. Air Force in India and the Fourteenth Air Force in China have used reverse lend-lease gasoline in operations against the Japanese.

Byproducts, the total petroleum received by the United States forces in India under reverse lend-lease, is charted as follows:

Item—	Quantity, in U. S. gallons
Aviation gasoline	113,309,012
Aviation oil	2,651,156
Motor vehicle gasoline	31,157,091
Motor vehicle oil	246,022
Diesel oil	3,682,727
Lubricants	87,328
Greases	572,046
Miscellaneous	2,807,869

In the European theater of operations, the second report on mutual aid issued by the British Information Services pointed out that oil from both American and British-controlled sources has been treated as a common pool, and United Nations requirements have been filled from the most appropriate sources, the deciding factor being the need for economy of tanker tonnage. Thus the substantial issues of petroleum products to American forces in the United Kingdom include American oil originally delivered under lend-lease to Britain.

British oil has been used predominantly, the white paper continues, in other parts of the world, and the quantities will increase as the Pacific war reaches its climax.

Petroleum products account for £58,882,000 sterling of the total of £131,665,000 worth of goods transferred to the United States under reciprocal aid. The petroleum total includes oil bunkers to U. S. naval and merchant ships, worldwide, and lend-lease oil valued at £24,000,000 retransferred to United States forces in the United Kingdom.

Actual transfer of gasoline and other petroleum products, however, tell only part of the story as brought out in the lend-lease report. The first problem in the campaign in France and the Lowlands was to get enough gasoline to the allied armies for their advance across France and Belgium and into Germany.

Job Done With Captured Cans

The job was done with "jerricans," oblong flat-sided 5-gal. gasoline cans developed by the Germans, used by Rommel in his Libyan victories, and captured by the British. In England, these cans were put into mass production, and in 1943 it was decided that the British should produce enough of them for their own use and the U. S. Army as well. By "D-Day," many millions of them were filled and ready to go, and they were among the first supplies to land on the French beaches.

The British also helped to build the first pipe line laid by the U. S. Army engineers from Cherbourg to Paris. Most of the pipe was supplied by the British under reverse lend-lease.

The biggest single reverse lend-lease project undertaken by the British was the building of the Eighth and Ninth U. S. Air Force bases and supply and assembly depots, a project involving $440,000,000 and tens of thousands of civilian laborers. British railroads carried oil and gasoline from ports and supply dumps to these bases.

Fighter protection for flying fortresses bound for interior German targets has been furnished through detachable auxiliary gas tanks which are jettisoned when the extra gasoline is used up by the fighters. Nearly all of these were made in Britain under reverse lend-lease. The total is now approching 300,000.

Made of old newspapers and other waste paper and processed under a formula first developed by British technicians, the tanks were made first in 108-gal. sizes for use on P-47's in the summer of 1943. Later the tank was adapted for use by P-51's and in January of 1944 production was started for a 165-gal. paper tank to permit P-47's to travel even farther.

Among raw materials furnished the United States under reverse lend-lease by June 30, 1944, is listed 70,000,000 gal. of benzol, worth $18,000,000.

Over-all goods and services furnished the United States by the British Empire has almost trebled during the past year, President Roosevelt said in a letter to Congress accompanying the lend-lease report. A year ago the governments of the British Commonwealth reported expenditures for lend-lease aid to this country at $1,175,000,000. By June 30 the figure reached $3,348,000,000.

Amerada Leases 200,000 Acres in Three States

CHADRON, Neb. — Amerada Petroleum Corp. has leased 200,000 acres of land in northwestern Nebraska and across the boundary in Wyoming and South Dakota. A representative of the company said it would begin drilling deep tests next spring.

Amerada and several other companies have had seismograph crews working in the area for several years but no deep test has been drilled since Union Oil Co. of California reached 5,000 ft. near Agate, Neb., in 1937, only to have a dry hole.

L. E. Etchison, of Tulsa, Amerada vice president in charge of the land department, said the wildcats will comprise an extensive oil exploration. The final leases closed last week embrace 10,000 acres of the Pine Ridge Indian reservation in South Dakota and one condition is that drilling operations on the reservation begin with a year.

NLRB Orders Election for Employes of WEP

WASHINGTON.— National Labor Relations Board has directed that an election be held within 30 days among the operating engineers of War Emergency Pipelines, Inc., at Baytown, Tex.; Sabine, La., and Bald Knob, Ark., to select representatives for collective bargaining. Workers involved are employed on the "big inch" crude-oil pipe line, the "little big inch" products line, and feeder lines in Texas and Louisiana.

Those entitled to vote include all operating and maintenance emloyes of the company's first and second divisions, truck drivers, station engineers, assistant division mechanics, assistant master machinist welder-foreman, delivery gagers, and dispatcher-telegraphers. They are to determine by ballot whether they wish to be represented by International Union of Operating Engineers, (AFL) or by Oil Workers International Union, (CIO).

Memphis Natural Gas Granted Right to Build New Lines

WASHINGTON. — Federal Power Commission last week issued certificates of public convenience and necessity to Memphis Natural Gas Co. for construction and operation of additional facilities in Arkansas, Mississippi and Louisiana, required for maintenance of adequate service to its present customers. The commission's order expressly provides that the facilities shall not be used for transportation or sale of natural gas to new customers of either Memphis Natural or United Gas Pipe Line Co. except upon specific authorization by FPC. The order also provides that Memphis Natural must commence construction of the facilities not later than December 15 and complete them at the earliest possible date. This provision was incorporated in the light of the evidence that the delivery capacity of the company's present main-line facilities is insufficient to meet adequately the peak-day requirements of customers and that the present deficiency would necessitate curtailment or complete interruption of service on peak days to many ultimate consumers, including hospitals, low-rent housing developments, educational institutions, office buildings, theaters, hotels and numerous industries, irrespective of whether they have standby-fuel equipment.

No Clear-Cut Decision

Last week's decision did not clear up the natural-gas industry's strong contention that FPC overstepped its authority in the original Memphis case decision. There appeared to be a technical possibility, however, that the Memphis company could extend its services by using only existing facilities for that purpose, reserving newly authorized capacity for the transmission exclusively to customers now served. Also, the company won the right to apply later for market extensions.

There is no clean-cut decision, however, by which FPC relinquishes its jurisdiction over future market expansion of the natural-gas industry. Therefore, it appears probable, natural-gas officials said, that basic issues in the Memphis case remain to be resolved.

A report on details of the construction authorized by FPC appears on the Pipe Line page of this issue, Page 98.

The estimated over-all cost of the proposed facilities is $2,553,000, of which $1,440,000 represents the cost of the Lisbon line and $1,113,000 the cost of the main-line looping. Memphis Natural proposes to continue in effect the present rates to its customers and no increase is contemplated.

The commission states that at the rehearing held in Memphis from September 7 to October 5 on its order of June 10, 1944, dismissing without prejudice Memphis Natural's application, additional evidence was offered with respect to the requirements of the company's customers, the availability on peak days of supplies from its existing facilities, the manufactured-gas and holder storage facilities of Memphis Light, Gas & Water Division, and standby-fuel equipment on consumer's premises.

"It is clear," the opinion states, "that the commission's order of June 10, 1944, dismissing the application, was based upon the fact that evidence then presented was not sufficient to show that the public convenience and necessity required construction of the proposed facilities."

The proceeding for rehearing was consolidated, for the purpose of hearing, with an application filed by the Memphis company on May 20, 1944, and amended August 22, 1944, seeking authority to construct and operate a 20-in. line approximately 49½ miles in length extending from the North Lisbon gas field in Claiborne Parish, Louisiana, to the company's Guthrie compressor station in the Monroe gas field in Ouachita Parish, Louisiana.

Gas Operators View Memphis Decision With Satisfaction

Directors of the Independent Natural Gas Association of America meeting in Tulsa November 25 decided to postpone the annual membership meeting for 1944 and to hold the election of officers and directors by mail.

The association appointed a committee composed of E. Buddrus, president; Paul Kayser, first vice president, and D. D. Harrington to express its views this week before the Federal Power Commission at Washington regarding the recently ordered natural-gas investigation.

Directors reviewed with satisfaction the November 21 decision of FPC granting Memphis Natural Gas Co.'s application for construction and operation of additional facilities to supply Memphis customers.

Hot Fight Predicted Over Repressuring in Oklahoma

OKLAHOMA CITY. — A lively fight in the coming session of the state legislature is predicted following announcement by Governor Kerr that he will recommend a law authorizing repressuring operations in the Oklahoma City field and other pools of the state under supervision of the State Corporation Commission, making possible the recovery of vast quantities of additional oil.

Because of conflicting views and interests two previous attempts to pass secondary-recovery measures failed. It is generally agreed that huge stores of oil still remain under the Oklahoma City field and others.

"Prior to the discovery of the West Edmond field," said Kerr, "Oklahoma production sank to the lowest level it has been in more than 20 years. The Oklahoma City field is an outstanding example of where secondary-recovery methods will greatly increase Oklahoma's recoverable oil reserve, but every field has a potential recoverable reserve which without secondary recovery will be lost to the operator, royalty owner, worker and the state."

Notwithstanding expected opposition, it is believed that a measure for secondary recovery will not face odds so great this time as in the past.

Continental Discovers New Field in Goliad County

PONCA CITY. — Continental Oil Co. November 28 announced the discovery of a new oil pool on a 3,700-acre unitized block in Cabeza Creek area, Goliad County, Texas.

From the first Wilcox sand, Continental 3 J. E. Pettus produced 258 bbl. of 39°-gravity oil in 24 hours last Sunday, after perforating from 7,604 to 7,607 ft., 7 hours on ¼-in. choke, and 17 hours on 10/64-in. choke.

Total depth of the well is 7,853 ft., and pay section is from 7,588 to 7,607 ft.

Fire-Swept Laboratories In Temporary Offices

CLEVELAND.—Temporary offices have been established by American Gas Association Testing Laboratories following the devastating fire which damaged the laboratories and injured 13 persons. The flames destroyed almost all records and research data with the exception of some testing and inspection files, which, though charred, are still usable.

Ickes Certain of Arabian Line Being Built, Despite Opposition

Petroleum Administrator Charges Line "Done to Death Without Benefit of Clergy"

AFTER regretfully noting that the proposed Arabian pipe line had been done to death by "many newspapers and commentators, without benefit of clergy," Petroleum Administrator Harold L. Ickes expresses conviction that the project will be carried out. Ickes' story of the controversy centering about this country's interest in oil in the Middle East appears in the December 2 issue of Collier's.

The 1,250-mile line, proposed last February by the administration in Washington to help insure an adequate supply of petroleum as one means of preserving world peace, would extend from the American-controlled Saudi Arabia and Kuwait oil fields to the Mediterranean, with the federal Government financing the estimated cost of $125,000,000 or more, which would be repaid by three American oil companies holding concessions.

American oil executives and others opposing construction of the pipe line, have contended that the Government is trying to participate in private industry by financing the project. To this, Ickes replies: "Interested companies would be left free to run their own business in their own way, without interference or suggestion even from the Government, which would own no stock, would name no directors and which would appoint no official of any of the three companies. The American Government did not choose to go into the oil business."

Government Stands to Profit

The three companies holding the American-controlled Arabian properties are Standard Oil Co. of California, The Texas Co., and Gulf Oil Corp. After explaining that the cost of the pipe line would be amortized with interest, within 25 years, Ickes adds that the Government would get "a small net profit."

Secretary Ickes reveals that the British Government delayed suggested oil conferences with the United States to "the precipice of impatience" before the Arabian pipe line was proposed. The British then realized, Ickes adds, that the pipe line would transport oil that would compete with British oil from the Near East and decided "to come over to discuss it."

Ickes contends that the newly created British - American international oil commission, which has signed an official document signifying "definite understanding between the two countries involving petroleum," will consider the proposed Arabian pipe line. "My own belief," he says, "is that . . . one or more pipe lines will follow as a matter of course" to provide a "cheap method" of transporting oil from the American controlled fields to the Mediterranean.

Ickes points out that the international oil commission has agreed that "there will be an equality of opportunity as to the exploration and the refining and marketing of oil (from the Near East) for either Britain or the United States." He adds: "There will be no restriction of markets, no cartelization indulged in by the two countries, but rather the promotion of efficient production in ample amounts to supply world requirements."

Ickes declares that the British-American oil negotiations were prompted by his belief that because of the need of oil in modern warfare, control of the major oil fields by peace-loving nations would do more than "many polysyllables solemnly written into a peace treaty," to assure that "aggressor nations would not again go out to conquer the world." The Persian Gulf area, including the Arabian fields, is said to have about 16,000,000,000 bbl. as compared with proved reserves of 20,000,000,000 bbl. in the United States.

PAW Reduces Personnel Of Its Subdistrict Office

CHICAGO.—Information required from oil operators has been further reduced by recent amendments to Petroleum Administration for War materials redistribution program 2 and to Petroleum Administration Orders 11 and 15, thus relieving the industry of a substantial volume of reports and detail work. As a result the Tulsa PAW staff has been reduced, and W. W. Vandeveer, director in charge of District 2, has requested that all purchase orders which Preference Rating P-98-b requires to be submitted to the PAW district office be sent to the Chicago office rather than the Tulsa office after December 1.

The production and materials division's work formerly handled in Tulsa has been transferred to Chicago, and the personnel previously assigned to this work will be released to the industry. "We shall continue to have representatives of the natural gas and natural gasoline division and the facilities security division in Tulsa," said Vandeveer.

OPA Offers Second Chance On Gasoline Losses

WASHINGTON.—Gasoline dealers and distributors will get a second chance to take advantage of existing rules for recovery of accidental losses if they were not cognizant of the rules in time to apply within the specified time, it was announced last week by Office of Price Administration.

This second chance is provided by an amendment to the gasoline rationing regulations authorizing OPA district directors to waive the 3-month limitation set for this type of application and to accept applications for shortages that occurred more than 3 months ago, if an applicant can show either that he did not know of the replenishment provisions or that he did not know of the 3-month limitation. This discretion to waive the time limitation extends only until March 1, 1945.

WPB Wants Tire Output Increased 25 Per Cent

WASHINGTON. — Forecasting a shortage of at least 1,000,000 truck and bus tires in the first quarter of 1945, War Production Board has asked the already strained rubber industry to increase its output 25 per cent. Representatives of the "entire tire industry, big and small," met here last week, H. G. Batcheller, vice chairman of WPB, said, and were asked to suggest every possible method of boosting production.

If such measures fail to meet the situation, Batcheller said it might again be necessary to "inaugurate a new program for construction of entirely new plants—an extreme step which we hope can be avoided." Construction of a new plant requires 9 to 12 months.

The 1,000,000-tire deficit remains even after WPB scaled down the demands of the Army and other claimants from 6,447,000 to 4,941,000 tires in the first quarter of 1945.

FOUNDED IN 1910

BY PATRICK C. BOYLE

The OIL AND GAS JOURNAL

Mental Reconversion

As competent analysts give more and more attention to the problems ahead they are stressing the fact that there are two phases to reconversion, one physical and the other mental. The first applies to production facilities and the other to the mental attitudes of those who will have the principal responsibilities of the future.

It is conceded that reconversion of the petroleum industry's physical equipment from war to peace can be accomplished with fewer difficulties than face most other enterprises which have a large part in the war program. But reconversion is more than the shifting of plant facilities or transformations in operating procedure.

When peace comes many would be satisfied to start where they left off when the war began and continue prewar practices. Any operator who endeavors to carry on his postwar activities on that basis will regret his shortsightedness.

Every major war has brought economic, social and political changes which extend to the roots of the civilization in which they took place. There is plenty of evidence that this greatest and most widespread of all conflicts will be no exception. Along with the physical adjustments there must be a reconversion in thinking which should be controlling in what is done.

Considerable thought in other industries is being given to the probable likes and dislikes of postwar customers. War savings and employment at high wages for a time at least will mean that prosperous buyers will pay more attention to quality. In the oil business this would mean much larger sales of the premium grades of motor fuels, lubricants and other products. More stress would be placed on all types of service.

Thought needs to be given to many other matters affecting consumer attitudes which in the final analysis determine the pattern of all industrial operations. Will consumers in increasing numbers support cooperative sales associations which have been aided by the avoidance of the war's heavy income taxes? How is private industry, which pays these taxes, to combat this unfair competition?

In manufacturing, by early 1945 nearly 15 per cent of a barrel of crude oil will be refined into aviation gasoline. It was about 1 per cent at the time of Pearl Harbor. These aviation plants can and will be converted to the production of civilian-grade gasolines. But the basic premise remains that this industry now has the knowledge and facilities to make superior fuels in large quantities at reasonable prices. Something important is going to come from that fact.

The war's processing achievements include production of the principal components of synthetic rubber and a long list of chemical compounds. However, this "know how" is of little value unless there are investigations to determine what must be done to commercialize in full these petrochemical developments. New products necessitate new marketing practices.

Labor policies are in a transition stage. Permanent government controls in all petroleum activities have strong proponents. An international oil plan, an integral part of world peace, is in the making. Inflation forces are at work.

Investigation will reveal that these and other war impacts have brought important changes in petroleum's outlook. Clear thinking, which recognizes that while the business is the same, some rules must be altered in line with new conditions, is the only sound foundation for future planning.

Catalytic Cracking Economically Practicable, Engineers Are Told

by Arch L. Foster

ST. LOUIS.—Momentous problems of the chemical industry, some looking toward postwar possibilities, were considered at the thirty-seventh annual meeting of American Institute of Chemical Engineers here last week. The meeting discussed catalytic cracking of petroleum, manufacture of aluminum from high silicia-content clays, production problems for penicillin, butadiene production from alcohols and from butylenes, selective extraction methods and other important subjects.

Catalytic cracking facilities will be expanded in the early postwar period, the members of the institute were told by R. H. Newton, of Catalytic Development Corp., and other authors. This expansion will be because of necessity for balancing production of motor and other fuels in refineries which now do not have catalytic cracking capacity, Newton indicated.

Leading technologists expressed the opinion that the principle of contact between catalyst and the vapors of reacting media will be extended to other reactions and processes in the petroleum and chemical industries. The systems developed, such as that of contacting a finely comminuted (fluid) catalyst with a vapor while passing through a reaction zone, or bringing into contact a porous bed of catalyst with a vapor passing countercurrently, will lend themselves to many chemical applications, these chemical engineers believe.

Discuss Catalytic Methods

Employing a silica-alumina type natural or synthetic catalyst, the Houdry process of catalytic cracking has found that the maximum economic yield of gasoline is obtained when operating at about 4 weight per cent of carbon deposition, based on the charge stock, it was stated. In regeneration of the spent, carbon-coated catalyst, the burning occurs in a narrow band about 3 in. wide. It has been found best to burn away the carbon at the rate of about 1.1 per cent by weight of the catalyst in 10 minutes, when the total deposit is not much more than that value, which equals about 7 grams per liter of catalyst. Higher deposits cause excessive catalyst temperatures during regeneration, with consequent damage to the catalyst life and efficiency. At lower rates of combustion the burning is incomplete. Catalyst activity becomes zero at 15-18 per cent carbon deposit.

One of the optimum cycles for Houdry cracking is 10 minutes, 8-second intervals for on-stream, and an equal period for regeneration. Another cycle used especially with short on-stream periods is twice as much time for regeneration as for on-stream.

One of the main system timers of this process has 900 contact points, arranged in five concentric circles in which one impulse is transmitted every 2 seconds. Other systems are used. Motor-operated valves are used, with a system of double closure checks to insure against accidents. In these valves steam is inletted to the valve bonnets to seal the valve against oil vapor leaks. In catalyst cases the main pressure drop is in the distributor and collector bushings, a drop which is 13 in. of water in each case. The path of the oil vapors in the catalyst bed is about 30 in., with a pressure drop of only slightly more than 2 in. of water.

Heat removal is so carefully arranged in these catalyst cases that the average distance between cooled surfaces is only ⅝ in., it was stated. The heat transfer rate between the case and tube steel surfaces and the cooling salt is 300-400 B.t.u./°F./sq. ft./hr. Design of the lower end of the cases is complicated by the need for passing salt air and oil vapor separately, necessitating three header areas at the bottom.

The heat of combustion of the catalyst-deposited carbon per liter of catalyst is 213 B.t.u. greater per cycle than the endothermic heat of reaction of the cracking operation in the cycle. Therefore, the system gains sensible heat during each cycle.

Salt Cooling System

The salt which passes through the tubes imbedded in the catalyst bed to absorb and carry away heat is a eutectic mixture of potassium nitrate and sodium nitrite, melting at 284° F., stable in the absence of air and noncorrosive to plain carbon steel below 900° F. The salt system operates under vacuum to prevent salt leaking into the catalyst bed. Salt-storage tanks are steam-blanketed to keep out air. The hot salt is used to generate 450-lb. steam, heat-regenerating air and to preheat incoming oil streams.

Gas Turbine Operation

The gas turbine operates on the expansion of the regeneration gases as they expand under the added heat. The 40,000 CFM (cubic feet per minute) turbine operates at 5,280 r.p.m. Theoretically it requires 4,410 kilowatts of energy to compress 41,900 CFM of gas. After heating in the regeneration cycle, expanding this original amount of gas yields 4,800 kw. of power or an advantage of 390 kw. In practice and with various losses the net power delivered to the generator is 120-138 kw. Catalyst temperatures now employed range from 650-875° F., with pressures up to 200 p.s.i. having been used in the Houdry operations.

T. C. C. Operations

Catalysts of both natural clays and synthetics of the silica-alumina types are used in the Thermofor process, the latter being the so-called bead catalyst. Catalyst beds vary in depth from 8 ft. to 35 ft. In regeneration the catalyst alternately burns in one zone and is cooled by generating steam in another zone. Seven to 10 burning sections are used, and the regeneration temperature is held to about 1,150° F., to avoid excessive catalyst damage. The depth of catalyst bed must be at least 1½ times the vessel's diameter to avoid static portions of the bed along vessel sides. The minimum pressure drop of the vapors in the reactor may be 70 per cent of the catalyst weight therein. The specific heat of cracking varies from 90 to 200 B.t.u./lb. of light products formed.

Heavy oil condenses on the catalyst at the reactor bottom, where charge vapors are entering. This oil is removed by a sweep of steam over the spent catalyst just below the vapor entrance to prevent excessive charge losses. The spent catalyst is carried aloft by elevators of low-allow steels, designed for 900° F. operating temperature maximum.

The fluid catalyst process was also discussed, but presentation of the data given was withheld.

Sinclair-Wyoming Posts Prices for Crook's Gap

Sinclair-Wyoming Oil Co. last week announced its posting of crude-oil prices in the newly discovered Crook's Gap field in Fremont County, Wyoming, effective November 22: Below 29° gravity 96 cents, with 2-cent differential, beginning at 98 cents for 29° to 29.9° gravity, to a top of $1.20 for 40° gravity and above.

A.S.M.E. Reactivates Petroleum Division at New York Meeting

by N. O. Fanning

NEW YORK.—Petroleum Division of American Society of Mechanical Engineers, which has been inactive for some years, is being reactivated for benefit of all mechanical engineers concerned with production and refining of petroleum. This action was the highlight, so far as petroleum technicians are concerned, at the A.S.M.E. annual meeting this week in New York.

The petroleum committee luncheon and meeting November 28 at Hotel Pennsylvania to discuss plans for reactivation of the petroleum division was largely attended by oil-industry representatives. Discussion dealt chiefly with plans for reorganizing the division.

Mechanical engineers affiliated with oil companies, however, found much in the week-long program of technical papers to engage their attention. Sectional assemblies listened to papers by top engineers on heat transfer, instrumentation and control of fluid movement, furnace performance factors, fuels, lubrication, and maintenance of equipment.

Benjamin T. Brooks, New York, consulting engineer, warned that estimates of proven petroleum reserves in this country must be revised downward in view of all-time high production levels. He pointed out that many fields are producing above maximum efficient rates and that the decline in discovery rates results in a net loss of available petroleum. Increasing prices were predicted. He expects this factor to stimulate technological improvements but warned that too much cannot be expected and will result in nothing revolutionary.

Development of gas-turbine engines for main-line locomotive service was reported by Paul R. Sidler New York, resident engineer, Brown, Boveri & Co., Ltd. This type of railroad power, the speaker explained, is designed primarily for long high-speed runs with few stops, making possible comparison with the large diesel-electric locomotives. The gas-turbine locomotive developed for American railroads consists of a basic unit of 2,500 hp. which can be used singly or may be compounded in units of 5,000 or 7,500 hp.

Coupled to form a 7,500-hp. giant capable of speeds up to 75 miles an hour, the gas-turbine locomotive and tender are 198 ft. long and weigh slightly over 1,000,000 lb. Fuel consumption at full load is 800 gal. of Bunker C fuel oil an hour. Starting is achieved by a diesel-generator group, the process taking about 5 minutes. Sidler explained that sudden heavy overloads on the gas-turbine do not stop it, as is the case with a diesel engine, but that such loads merely lower the operating speed of the machine until fuel-oil supply has been automatically adjusted.

Laboratory work measuring the chemical changes taking place in natural and synthetic rubbers at high temperatures was described in a paper presented by R. D. Andrews and A. V. Tobolsky of the department of chemistry, Princeton University.

It has been found, they reported, that in both natural and synthetic rubbers two chemical reactions take place simultaneously in the rubber at high temperatures, and change the structure of the rubber network. The first is a reaction which cuts the long chain molecules in the rubber, and the other is a reaction in which the molecular chains are linked together. Both reactions occur in the presence of oxygen, and they are constantly competing with each other—each reaction undoes the work of the other.

"The cutting reaction tends to make the rubber soft and tacky, while the crosslinking reaction tends to make the rubber hard and brittle. Whether a rubber softens or hardens when it deteriorates at high temperatures depends on which of the two reactions is the faster. In natural rubber cutting occurs more rapidly than crosslinking at first but later the rate of crosslinking overtakes and passes the rate of cutting. This is the reason that natural rubber softens first and then hardens when it is heated in air at high temperatures. In butyl rubber, cutting is always faster than crosslinking and so it softens in heat aging. In GR-S, the main synthetic rubber manufactured at the present time, the rubber molecules are always crosslinked more rapidly than they are cut."

Surplus of Tubular Goods Only Need Be Reported

WASHINGTON.—Oil operators no longer are required to report surplus stocks of any critical materials except tubular goods, Petroleum Administration for War announced last week. Ralph K. Davies, deputy petroleum administrator, explained that it will be necessary to report on tubular goods when the surplus, at an individual location or stockpile, exceeds 1,000 ft. of casing, tubing, or pipe from 2 to 8 in. in internal diameter, or exceeds 500 ft. of tubular goods over 8 in. in diameter. Surpluses of refinery and of distribution and marketing materials need not be reported. Before the amendment, petroleum operators were required to report surplus material of all kinds.

This further relaxing the control of critical materials was effected by amending PAW Materials Redistribution Program No. 2. Davies urged petroleum operators to review their records of tubular stocks and to report any changes to PAW on Form MA-3A in order to keep current the nation-wide inventory of these materials.

"Because of the excellent cooperation of petroleum operators," said Davies, "the PAW redistribution program has made it possible to distribute large quantities of surplus critical material to help fill the urgent needs of the industry. The success of the redistribution program and the improvement in the supply of steel now makes it possible to ease further PAW controls of petroleum industry critical materials. Although the supply of steel has improved recently, the demand for tubular goods in the industry continues to exceed the supply. PAW's accelerated drilling program for 1945, calling for a minimum of 27,000 oil and gas wells, makes it necessary to continue to help operators in the redistribution of surplus tubular goods."

Prices in Oklahoma Fields Posted by Mid-Continent

Mid-Continent Petroleum Corp. last week announced it would pay the following prices for crude oil purchased in Oklahoma except in the Bald Hill, East Edna and Pollyanna pools, in Okmulgee County, and the Kellyville and Slick pools, in Creek County: Below 21 gravity, 85 cents, with 2-cent differential, beginning with 87 cents for 21 to 21.9 gravity, to a top of $1.25 for 40 gravity and above.

The maximum price for the Cement pool, in Caddo County, and the Oklahoma City pool, Oklahoma County, follows the same schedule, but reduced 3 cents for each degree of gravity below 20 down to 16. Below 16 gravity, 70 cents. All the prices are effective as of August 1, 1944.

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OPA Declares Gasoline Black Market Almost Under Control

WASHINGTON.—While the problem of gasoline black markets will last as long as rationing, Office of Price Administration thinks it is now fairly well under control, thanks to effective industry cooperation and OPA's own staff of enforcement agents.

The industry, W. E. Remy, chief of the gasoline enforcement section, said in his first interview since coming to Washington November 1, has helped eliminate a vast number of violations arising from indifference and carelessness, allowing OPA to concentrate its few but well-trained guns upon the willful violators.

Chronologically, the real attack upon the black market began on December 15, 1943, when the enforcement activities of OPA moved from hit-or-miss checking of filling stations to work with distributors.

The $50,000 advertising campaign sponsored by Petroleum Industry War Council is credited by OPA with a large percentage of the public education which has reduced the black market menace. Coupled with this, PIWC's black-market committees, organized in all the Petroleum Administration for War districts, went out to explain the importance of the black market to dealers.

Court records reflect the influence of the concerted Industry-OPA program. The number of severe sentences has grown, the number of small fines for serious violations diminished, and, OPA believes, the courts no longer hold that theft of coupons is theft of an article of no tangible value.

"Industry has done a good job all the way through," Remy told The Oil and Gas Journal. "The industry advisory committees attached to district offices have been extremely helpful, both in explaining the industry's problems to OPA and in carrying back the OPA viewpoint to the industry."

The job of enforcement is not being done entirely by education and publicity, of course. OPA's staff of trained special agents—a staff second to none, Remy maintains—brings in the violators.

This is the published record, from January through September of this year, the latest available figures: A grand total of 35,978 violators, broken down as follows: 28,127 local board revocations, 1,999 district office revocations, 4,277 suspension orders issued, 174 fines and imprisonments, 423 fines only, 531 probations or suspended sentences, with or without fines.

While OPA has no breakdown of actions taken against dealers or distributors as opposed to consumer actions, the revocations, local and district, are largely consumer violators, but suspension orders and injunctions are issued almost exclusively against dealers.

The OPA investigators, their number kept secret, were organized last July 1. They are trained in the Treasury training school, given rigorous instruction in the law of criminal investigation and in criminal-investigation techniques, and this is followed by instruction in OPA problems and methods.

The job of these agents is to run down the gangster operators. Routine OPA checkers handle much of the small violation total which shows up through the debiting procedure. In the first 3 months of their activity, the special agents made 132 arrests. Forty-five of these were consumers, who bought counterfeit coupons for their own use; 44 were peddlers; 34 were large-scale distributors; 9 major suppliers.

Having this trained group has worked to OPA's advantage in another way. These men can cooperate with—and command cooperation from—both local police forces and federal investigators.

OPA's present system was worked out by Shad Polier, Remy's predecessor. Remy, a former regional enforcement director in Dallas, replaced him November 1.

DEATHS

Charles V. Chenault, 53, independent operator, active in the development of important oil fields and leases in the North Texas area, died November 22 in Amarillo. In the first World War he was a machine gunner in the famous Tennessee Old Hickory division.

H. H. Thompson, 69, for 26 years a district foreman for Mid-Continent Pipe Line Co., retiring a year ago, died November 23 in Tulsa.

Walter J. Chappel, 62, of Portsmouth, England, an executive of the marine division of Gulf Oil Corp., died November 20 in New York.

Byron A. Evoy, 84, a pioneer Ontario oil operator, died at Oil Springs, Ontario, November 22. Active in production from 1881, he entered the employ of Crown Tanking Co. in 1887, and in 1921 became oil receiver for Imperial Oil, Ltd., retiring in 1935.

Leonard D. Embrey, 65, retired oil operator, died November 22 in Electra, Tex.

John E. Elms, 44, independent oil operator of Dallas and Wichita Falls,, died November 19 at his home in Dallas.

James M. Keelin, 51, traveling auditor for Magnolia Petroleum Co., with headquarters in Dallas, died November 19 in a Shreveport hospital.

Dr. Thomas Swinden, 58, internationally known metallurgist, died October 27 of a heart attack at the Stocksbridge works, England, of Samuel Fox & Co., Ltd. Dr. Swinden joined the Fox organization in 1909 as chief chemist, later was made chief metallurgist and then works manager and director. In 1932 he relinquished the post of works manager to become director of research for The United Steel Cos., Ltd., but retained his directorship in Fox. He was a director also of Distington Hematite Iron Co., Ltd., and of British Magnesite Corp., Ltd.

John B. Quinn, 60, for 35 years an oil operator, died November 22 in Cape Girardeau, Mo. He had lumber interests and was active in flood-control projects.

William F. Davis, 77, retired operator, died November 23 in Wichita Falls, Tex. Before his withdrawal from business activities 5 years ago, he was president of Orient Gas & Oil Co., and earlier he had served for 13 years as president of Orient Petroleum & Refining Co. Before entering the oil business 26 years ago Davis, a graduate of George Peabody College, with an LL.B. from Vanderbilt University, practiced law in Nashville.

John S. Wallace, 73, oil producer, died November 17 in Oil City, Pa. His entire life had been spent in the neighborhood of Oil City and Rynd Farm, where his oil operations were.

Everett H. Grubb, 65, independent oil producer, died recently in Torrance, Calif.

M. E. Cooper, 38, of Fairfield, Ill., district manager of Pringle Powder Co., Bradford, Pa., and **Joseph Roberts,** 43, of Owensboro, Ky., employe of the same company, met instant death November 25 in an explosion at a nitroglycerin mixing plant near Masonville, Ky. **John Hunter,** 53, Bradford, was critically injured in the accident, which demolished the plant.

Influence of Drilling Practices On Drilling-Mud Programs

*by E. R. Albert, Jr.**

Recognizing that mud treatment is an integral part of sound drilling practice, this article discusses various phases of drilling and their relation to adoption of effective mud programs. Deeper drilling, use of less protective casing and more complete testing programs are major factors governing mud programs and costs. Importance of good makeup water is stressed.

DRILLING-MUD programs and costs have become more critical with deeper drilling, less protective casing and more complete testing programs. The purpose of this paper is to project the reasons for hole trouble in the presence of a satisfactory drilling mud.

The information contained in this discussion has been gathered from actual field observations in the Mid-Continent area. The variables in this type data make it difficult to draw definite conclusions which apply to all areas. However, the recent intensified activity in the West Edmond area has provided an opportunity to study a large volume of information over a short time. Many persons have a tendency, while thinking along the lines of drilling practices, to allow the exception to stand out rather than to accept the general rule.

A mud engineer can no longer separate his duties from drilling operations but must become more adept at being a well-rounded drilling engineer since mud treatment and mud programs are an integral part of sound drilling practice. Either endeavor fails without the full support of the other.

To date, sufficient thought has not been given to the selection or procurement of good makeup water for preparing drilling muds. Actually the selection of makeup water is as important as the selection of waters used in boilers or drilling engines. Hole failures are often much more costly and many times more serious than mechanical failures. Selection of bad water is immediately apparent when used in boiler or engines because of the ill effect on mechanical operation; but the selection of bad water for drilling mud is not nearly so obvious since its effects are progressive and are usually interpreted as drilling problems and are corrected as such. Daily treatments of drilling muds to minimize the effects of bad water require greater amounts of mud materials and chemicals.

*Division engineer, Baroid Sales Division, National Lead Co., Tulsa. A paper presented at Tulsa chapter, A.I.M.E.

Number of Water Surfaces

In any one field there are usually a number of sources of water varying in degree of purity. Oklahoma's West Edmond field offers a good example of this wide selection. (A cross-section of the makeup waters being used has been prepared, and is available from the author.) Actually 20 or more different waters are in use, varying from good to very bad depending upon the type and amount of dissolved salts.

The classification of waters from good to very bad has been based primarily upon the quantity of calcium and magnesium salts and secondarily upon the quantity of sodium salts present. Waters having a total of 3± e.p.m. or less of combined calcium and magnesium salts were considered good. In these waters bentonitic clays will have good yield, and reasonable viscosities and water losses can be obtained without the use of chemicals. Waters containing between 3 and 8± e.p.m. of combined calcium and magnesium salts were considered fair makeup waters. A water containing from 8 to 22± e.p.m. of combined calcium and magnesium salts was classified as a bad water. All waters containing more than 22± e.p.m. of calcium and magnesium salts were classified as being very bad for drilling mud use.

It should be pointed out that the application of water-analysis data to clay yields and the extent of proposed chemical treatment of drilling mud is relatively new and the above classification may be subject to minor revision as this type of work progresses.

To further develop the importance of these data, Table 1 is presented. These data represent tests showing the effect of makeup waters, selected from the above classification, on the yield of bentonite. These data indicate that the efficiency of bentonite yield is reduced 24 per cent when the quality of water progresses to very bad. Thus it will require one-third more bentonite to obtain the same desired viscosity while using a very bad water as compared to the amount of bentonite required to obtain the same viscosity when using a good water. It is also evident that the water losses of the muds using bad waters are higher at the same viscosities than those of a mud using good water. Therefore chemical treatment is required to disperse the mud in order to lower the water loss which, in turn.

TABLE 1—YIELD OF A BENTONITE IN VARIOUS FIELD MAKEUP WATERS AND EVIDENCE OF CALCIUM AND MAGNESIUM REMOVAL BY THE BENTONITE

Water—	Distilled			T-709			T-690			T-691			T-711		
Classification	Very good			Good			Fair			Bad			Very bad		
Per cent bentonite	5	6	7	5	6	7	5	6	7	5	6	7	5	6	7
Viscosity, c.p.e.	10.5	25.0	47.0	9.0	21.0	39.0	8.0	18.0	35.0	6.5	17.0	32.5	4.5	7.0	15.5
Initial gel, gm.	11	32	77	11	29	75	14	34	77	17	39	82	9	21	35
10 min. gel, gm.	30	57	130	29	67	115	26	75	105	38	65	108	19	34	54
Yield, bbl./ton		102			98			94			92			78	
Per cent efficiency		100			96			92			90			76	
30-ft. wtr. loss, A.P.I.	11.5	10.0	9.0	12.3	10.3	8.7	13.4	11.1	9.8	15.0	11.6	10.2	22.0	17.0	14.0
30-ft. cake, 32nd in.	3	3	4	2	2.5	3	3	3	4	3	3	4	3	3	3
Water loss, 15 c.p. mud		11.0			11.2			11.4			11.6			14.0	
Ca., e.p.m., water		0.0			0.75			2.0			4.9			19.0	
Ca., e.p.m., filtrate		0.33			0.33			0.54			0.84			8.00	
Mg., e.p.m., water		0.00			0.26			1.40			3.80			2.90	
Mg., e.p.m., filtrate		0.10			0.16			0.19			0.54			3.00	

lowers the viscosity and again requires additional bentonite for raising the viscosity to the original desired value. Mud treatment under such conditions becomes involved in a vicious cycle of chemical and bentonite additions.

Fig. 1 graphically illustrates the effect of calcium and magnesium hardness on bentonite yields and water losses. To emphasize reduced yields and bad effect on water loss reduction, the following examples are presented.

The difference in quality of the drilling muds obtainable is illustrated by two wells on offset leases in the West Edmond pool. Formations and depth of hole for all practical purposes were the same. The difference is in the makeup waters used. Well A was using water from a 500-ft. water well in the old Edmond pool area (T-673) containing a combined calcium and magnesium salt content of 1.3 e.p.m. and a sodium content of 6.8 e.p.m. Well B was using makeup water from Cotton Wood Creek (T-675) containing a combined calcium and magnesium salt content of 20.7 e.p.m. and a sodium content of 9.1 e.p.m. The tabulation presented in Table 2 shows the results of the initial bentonite and soda ash treatment. It was necessary to place Well B on caustic and quebracho treatment earlier than Well A in order to obtain the desired water loss. In addition, more bentonite was required to maintain desired viscosity and gel strength. It is commonly believed that soda ash will remove harmful salts and allow bentonite to yield normally. That this is not the case is indicated by the additional bentonite required to obtain the desired viscosity. It can be definitely stated that whenever a chemical reaction results in soluble salts the water loss is always higher for any given viscosity.

In another instance a well was being drilled to 5,200 ft. with only 200 ft. surface casing. Makeup water for the mud was obtained from the Cimarron River (T-678) because of its availability. Commercial mud and chemical expenditures on this well were $3,000. Even with this high mud cost the well was completed with water losses in excess of 55 cc.

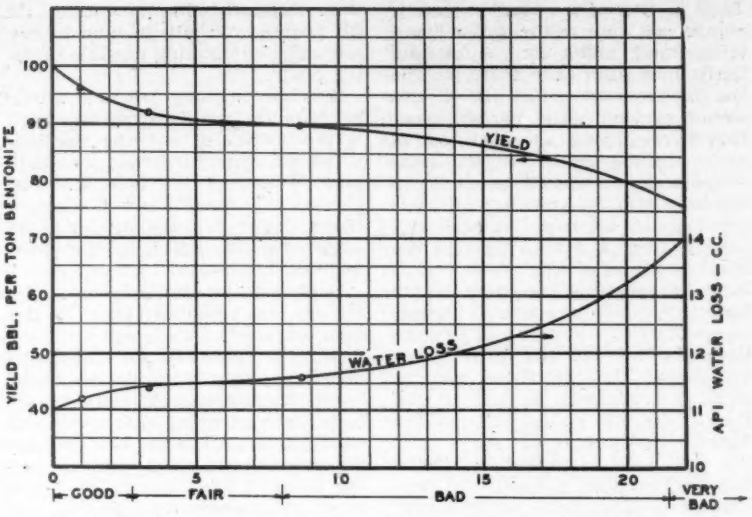


Fig. 1: Equivalent parts per million calcium and magnesium hardness only

A.P.I. Although no trouble was experienced, it is obvious that this operator was taking a risk since wettable Pennsylvanian shales were exposed. A fishing job could have proved disastrous. The costs of mud materials and chemical required to drill two offset locations using a water supply from a reasonably near surface pond were $400 and $500 respectively. Both of these wells were drilled with muds having water losses of less than 25 cc. A.P.I. and the extreme risk from hazardous hole conditions was eliminated.

The above discussion concerning makeup water suggests that judgment should be used in the proper selection of the available waters rather than pretreat makeup waters for mud use. Past experience has proved the expense and inconvenience of installing treating systems for pretreatment of water for mud use to be, in most instances, uneconomical. Unfortunately pretreaters or water softeners for boiler water, engines, etc., are not satisfactory for mud use since most of them have soluble salts as a result of their chemical reactions. To date, pit treatment of the mud to overcome water problems is the most satisfactory method.

Obtaining an electric log is oftentimes difficult and expensive. However, the importance of these logs justifies almost any expenditure. It is true that oftentimes lack of mud control has resulted in failure to obtain an electric log. Assuming, however, that drilling mud is satisfactory, as indicated from other drilling operations, and a failure has been encountered in obtaining the electric log, other conditions must have caused failure. Often the obtaining of these logs is entirely dependent upon the driller who pulls out of the hole prior to running the survey. For example, generally speaking, all supervision is present at the rig while circulating to see if the hole is clean and to make the necessary arrangements for running the electric log. When everything is in order word is given to the driller to come out of the hole and usually the supervision either goes home or goes to sleep leaving the most critical operation to the judgment of the driller. This, in many cases, is sufficient. In other instances, it is unfortunate since the driller may be directly responsible for the success of obtaining the electric log. Actually, his instructions are to pull the drill pipe out of the hole, and whatever difficulty he may have in getting out of the hole is secondary in his mind.

Considerable difficulty has been experienced in obtaining electric logs in the West Edmond field. It soon became noticeable that identical muds failed to obtain electric logs of these wells. Muds were changed to high viscosities and low gels, to low viscosities and high gels, to moderate viscosities and high gels, and all worked part of the time but failed as often. Closer observation on these wells revealed that the trip out of the hole prior to running the electric log influenced the chances of success. The Bois

TABLE 2

	Well A using water T-673		Well B using water T-675	
	Before	After	Before	After
Vis. Marsh funnel	31	35	28.5	35
Vis. cp.	7	10	4	12
Initial gel	20	7	7	27
10-min. gel	25	22	14	40
Water loss, A.P.I.	54	19.2	90	31
Amount bentonite, sacks	..	120	..	225
Amount soda ash, lb.	..	1,000	..	1,800

Analysis of Makeup Water (e.p.m.)

	T-673	T-675
Calcium	0.9	13.3
Magnesium	0.4	7.4
Sodium	6.8	9.1

d'Arc section of the Hunton lime is porous and, due to the water losses of the muds being used, a fast and fairly thick filter cake develops. The last bit usually drills all of this section and into the harder lower Hunton requiring as much as 24 hours' drilling time. After the usual 4 hours of circulation to clean up the hole prior to running the electric log, the bit is pulled and wall cake is dragged off all through the Hunton porosity. The weight indicator reveals this condition. Quite frequently wall cake is also present on the Bartlesville sand and Oswego lime. As the bit and drill collar are pulled through these sections there is a tendency to ball up and these balls are pulled off and are distributed through the sections. If the drill pipe is pulled up above the Oswego lime (± 6,400) and then lowered to total depth without putting on the pump and then again pulled, the electric-log survey seldom fails. By this operation, the bit pushes any balls of mud to bottom, thus eliminating possible bridging plugs.

Another drilling practice widely neglected in the Mid-Continent area, is the matter of keeping the hole filled on trips or when the drill pipe is out of the hole for long periods of time. Failure to observe this practice may account for blowouts, excessive caving of the hole, and water intrusion.

Surface-water intrusions are by far the most serious result in this area. Because of the competent surface rocks drilled in the Mid-Continent area, very little surface casing is set. Therefore, many shallow surface sands carrying both gypy and brackish waters may become exposed or at least able to flow against the lowered head due to drill-pipe withdrawal. Generally speaking, water intrusion is not noticed until a depth is reached by which the withdrawal of the increased amount of drill pipe lowers the fluid head sufficiently during a trip to allow entrance of these waters.

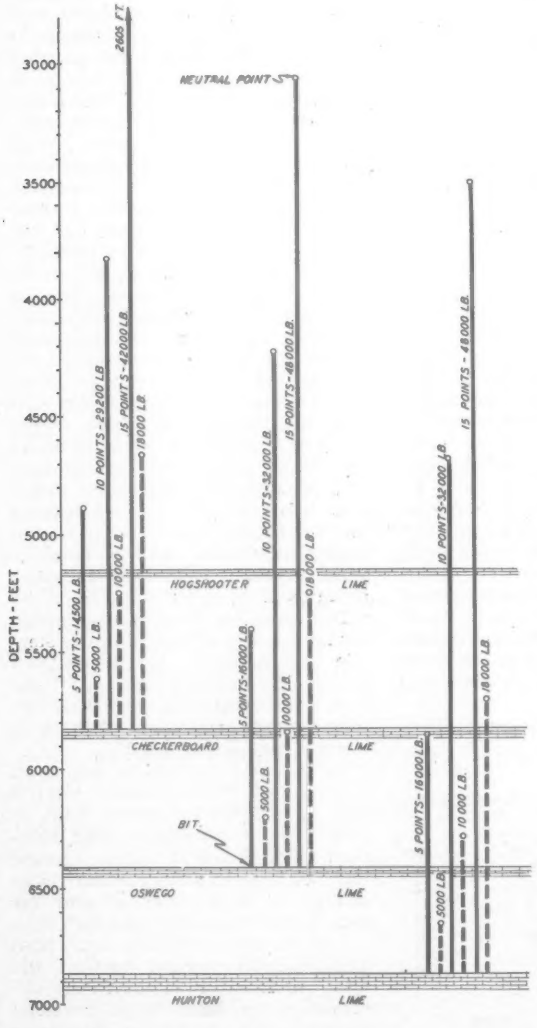


Fig. 2: Location of neutral point in drill string with selected bit weights. 4½-in., 16.6-lb. drill pipe, 10-lb.-per-gal.-mud

To illustrate this point still further the following example is presented. Recently a well being drilled in Oklahoma started having mud trouble. At approximately 7,000 ft. the water loss gradually increased from 7.5 cc. A.P.I. until it reached 8.5 to 9 cc. A.P.I. by 7,450 ft. The usual bentonite and chemical treatment failed to hold the proper water loss. Viscosity and gel strengths began to act queerly. The mud had an extremely fast gel. Although no hole trouble had been noticed, unreasonable amounts of material and time were required to maintain the mud. When the mud was thoroughly tested it was found that the chloride content had increased from a normal 3,500 p.p.m. to 7,700. Upon checking rig and crew operations it was revealed that filling the hole on trips was being neglected due to fillup line not being properly connected. Arrangements were made to keep the hole filled and the mud was diluted with water until the normal chloride content was reached at which time mud treatment returned to normal.

This well had 2,140 ft. of surface casing set and at approximately 2,300 ft. the electric logs on offset wells revealed the presence of a good section of Garber sand containing salt water. Since shallow sands in this area usually have a pressure equal to a head of water this sand had an estimated pressure of 995 p.s.i. In withdrawing approximately 7,000 ft. of 4½-in. drill pipe without filling up the hole, the fluid level could have fallen approximately 575 ft. which would allow, with 10-lb. per gal. mud in the hole, a drop of 300 p.s.i. The hole when full of mud would exert a hydrostatic pressure at this depth of 1,195 p.s.i. and a drop of 300 p.s.i. due to drill-pipe withdrawal lowered hydrostatic head to 895 p.s.i. which is 100 p.s.i. lower than the estimated pressure in the Garber sand. Assuming that saturated salt water entered the hole to equalize this pressure it would indicate that approximately 15.6 bbl. of salt water entered the hole and filled to a height of 192 ft. above the top of this sand. In this 1,000-bbl. mud system it was possible to increase the chloride content 3,700 p.p.m. with each round trip.

Good Practice Reduces Cost

From the above example, it is obvious that shallow gas sands can blow out and sloughing shale sections might be endangered due to this pressure reduction. Aside from the physical hazards involved, large savings in mud costs can be realized by good drilling practice.

Since, as previously mentioned, drilling mud is a corollary to successful drilling, it follows that even with an accepted good mud circulated in sufficient volume, it is necessary that certain drilling practices be followed or hole trouble will develop. It has been demonstrated in the West Edmond field that running long sections of drill pipe in compression, to obtain heavy weight on the bit, causes caving of the exposed shale sections resulting in difficult connections and trips, failure in obtaining electric logs and drill-pipe tests, complications of fishing jobs, and reduction in footage drilled per day.

It is generally not realized how much drill pipe must be operated in compression to obtain the desired bit weight. In West Edmond it is common practice to use one 6-in. o.d. by 30-ft. drill collar which weighs 2,000 lb. in 10-lb. per gal. mud. To obtain more than 2,000 lb. on the bit it is necessary to run more drill collars or to run varying

TABLE 3—EFFECT OF DRILLING WEIGHTS ON DRILLING RATE
(Considered in feet per day rather than feet per hour)

No. wells considered	Weight on bit		Drilling rate in feet per day: Black shale section, 5,200 to 6,400 ft.	Drilling rate in feet per day: Over-all, 5,200 ft. to T.D. (—7,000 ft.)
	Class	Pounds		
12	Light	18,000 lb. or less	71	67
7	Medium	18,000 to 36,000 lb.	66	58
15	Heavy	36,000 lb. or more	68	58

amounts of pipe in compression. The point below which the drill pipe is in compression and above which it is in tension is referred to as the neutral point and is the top of the drill string shown in Fig. 2 which is a graphic illustration of the length of 4½-in. 16.6-lb. drill pipe that must be in compression in 10-lb. per gal. mud to obtain common drilling weights of 5, 10 and 15 points when the bit is at the top of the Checkerboard, Oswego, or Hunton limestones. It is apparent that when drilling the Oswego or Hunton limestones with as little as five points weight that the shale section above the Oswego is subject to the action of drill pipe in compression. When drilling the Hunton with 10 points on the bit, all shales below the Hogshooter are acted upon by drill pipe in compression. With drill pipe in compression, the pipe is spiraled around the hole and bowed against the shale. The repeated hammering of the pipe causes shale sloughing with subsequent hole enlargements. As hole diameter in the shale increases, pipe bowing is accentuated, resulting in bent drill pipe. While some bent pipe is caused by hitting bridges and spudding, a large amount of bowing is due to the pipe working in enlarged shale sections. It is not uncommon in the Mid-Continent area to see 5 to 15 joints of drill pipe lying on the racks waiting to be straightened. The bowing of the pipe in the enlarged shale section is not only harmful to the pipe, but also leads to trip difficulties and fishing jobs. It is not uncommon in West Edmond, when drilling below the Oswego lime, to take from 3 to 4 hours in making a connection or for a trip to require twice the normal time. This, in most instances, is due to hole conditions caused by poor drilling practices rather than drilling mud. The following example illustrates the difficulties encountered by running with too much weight on the bit.

The Bois d'Arc section of this well drilled exceptionally easily, requiring 2 to 3 minutes per foot. The base of the Bois d'Arc was reached at tour changing time and the new driller started drilling the dolomite below the Bois d'Arc section. As is the custom, the driller observed the time being made on the preceding tour and in order to continue with this rate, increased the weight on the bit.

Just before the Bois d'Arc section had been reached, three cores were cut and a drill-stem test made with no hole trouble or caving on the bottom. The mud was in good condition as indicated by the small amount of shale being circulated out of the hole.

Immediately after placing extra weight on the bit, larger quantities of shale showed at the shale shaker. When the tool pusher observed what was occurring, a trip was ordered. In coming out of the hole the pipe tried to stick and considerable time was spent making the first half of the trip. An attempt to run an electric log after this trip failed. When running in with a new bit, several shale bridges had to be drilled and approximately 12 hours were consumed in washing and drilling to bottom.

The hole was conditioned by slowly drilling ahead with light weight. The large volume of shale coming over the shale shaker decreased until only a very small amount was being circulated out. The pipe was then pulled and the electric log obtained without any difficulty.

It is generally true, in hard rock drilling, that heavy bit weight increases the drilling rate per hour, but in certain areas, where weight is obtained from the pipe, the time gained when drilling is more than offset by difficult connections, fishing jobs, and trips. The drilling operator must be concerned with the daily drilling rate and not just the footage made while the bit is on bottom.

To evaluate the daily drilling rate with light, medium, and heavy bit weights, a survey was made of 34 rigs operating in the West Edmond field. The wells were not purposely selected, but were operations at which the manner of drilling was well known. Table 3 presents the data obtained from the survey.

The rigs which drilled the Pennsylvanian black shale section with light weight on the bit made more hole per day than the rigs which drilled with medium or heavy weights. In drilling from the top of the black shale section to total depth, which is approximately 2,800 ft., the rigs operating with light weight made more hole per day and reached total depth in an average of 27 days as compared to an average of 31 days for the medium and heavy-weight operators. The saving of 4 days' rig time represents appreciable revenue to the contractor.

Drill-Collar Practice Varies

In Oklahoma and Kansas, it is common practice to run only one drill collar, whereas in comparable hard-rock country like West Texas, it is not uncommon to run six or even eight drill collars. It is believed that running additional drill collars in Oklahoma and Kansas would increase the daily footage since the weight on the bit could be increased without causing caved shale sections that result from running the pipe in compression. Most operators use only one drill collar due to the fear of fishing. Grant and Texter* have presented data indicating that many drill-pipe failures are the result of running drill pipe in compression, so it follows that fewer fishing jobs would result if bit weight was obtained from collars instead of drill pipe. With present-day drilling muds

(Continued on page 61)

*"Causes and Prevention of Drill Pipe and Tool Joint Troubles," by R. S. Grant and H. G. Texter, Drilling and Production Practice, 1941.

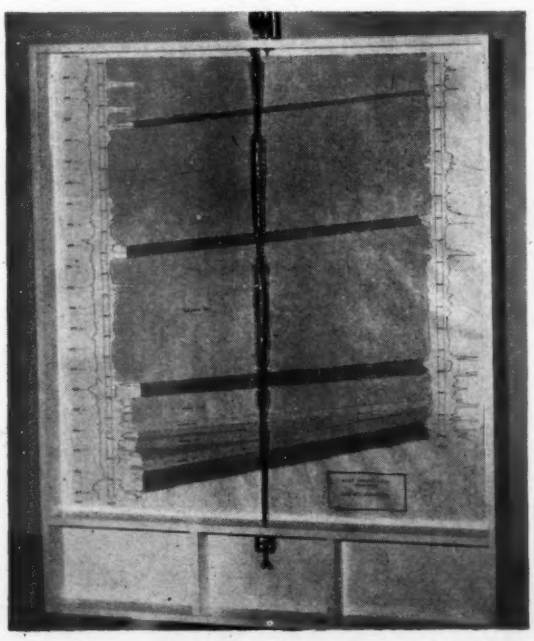
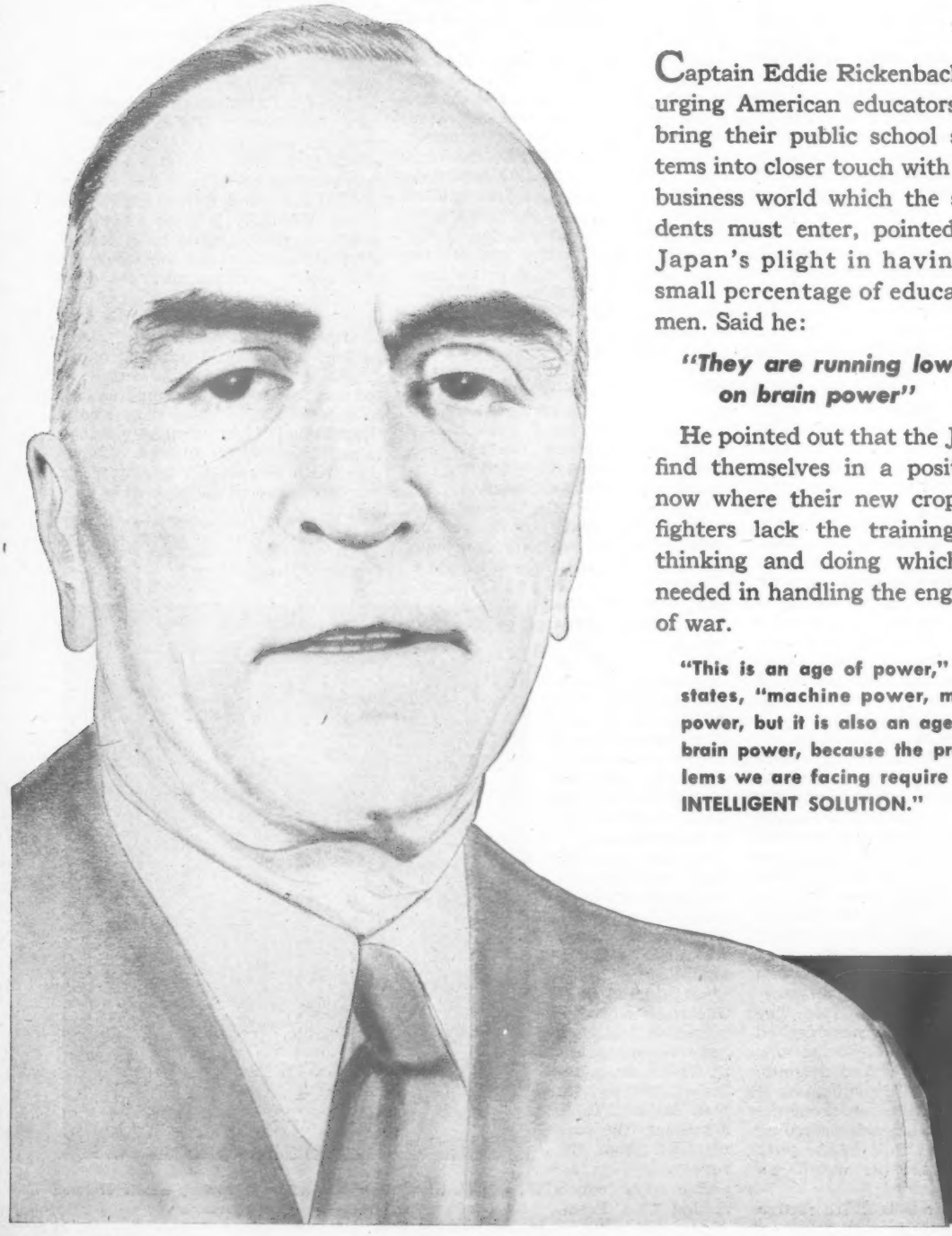


Fig. 3: Model of West Edmond well showing effects of running drill pipe in compression

then he said to himself

"They're Short on Brains"



Captain Eddie Rickenbacker, urging American educators to bring their public school systems into closer touch with the business world which the students must enter, pointed to Japan's plight in having a small percentage of educated men. Said he:

"They are running low on brain power"

He pointed out that the Japs find themselves in a position now where their new crop of fighters lack the training in thinking and doing which is needed in handling the engines of war.

"This is an age of power," he states, "machine power, man power, but it is also an age of brain power, because the problems we are facing require an INTELLIGENT SOLUTION."

Plastic Coating Used to Prevent Corrosion of Oil-Field Equipment

by E. H. Short, Jr.

WHILE many remarkable uses of plastic materials have been predicted for the postwar period, one of the most promising applications, as far as the oil industry is concerned, is now already in use. It is the application of a plastic coating to oil-field equipment as a means of preventing corrosion.

One of the most recent installations of plastic-coated material was made by a major company in an East Texas salt-water-disposal well. In this particular case, the whole string of 4½-in. tubing and also surface connections were plastic coated. Prior to the installation of plastic-coated tubing considerable trouble was experienced with plugging of the formation by iron oxide contamination.

Running Time Same as Ordinary Pipe

In running 4,535 ft. of plastic-coated tubing in this well the required time approximated that of ordinary tubing. Since the coating is applied to tubular goods by dipping the joints in a vat containing the plastic, it might appear that a means of protecting the threads would be necessary during the process. However, the thickness of the coating permitted to remain on the threads does not exceed thread tolerance and the string of tubing is made up without difficulty. That the coating has sufficient durability to withstand oil-field handling was illustrated by the fact that no damage was done through the use of a spinning rope in running the tubing. It is necessary, however, to use a special friction-type tong in making up plastic-coated tubing, as show in Figs. 1 and 2.

The plastic-coated surface connections used on the salt-water-disposal well are shown in Fig. 3.

Coating Material

The plastic material being used is a phenolic thermo-setting-type resin belonging to the lastomer class of rubbery polymers. One of the most important physical characteristics of this type of material is its excellent adhesive quality to all types of metal surfaces. It has an outstanding ability to resist all solvents, acids, and alkalies. This plastic material, from all reports, seems to have a high degree of flexibility and will with-

Fig. 1: Making up Tube Koted string of 4½-in. tubing at salt-water-disposal well

Fig. 2: Friction tongs used in running pipe. These tongs do not damage exterior coating

Fig. 3: Plastic-coated fittings used on East Texas salt-water-disposal well

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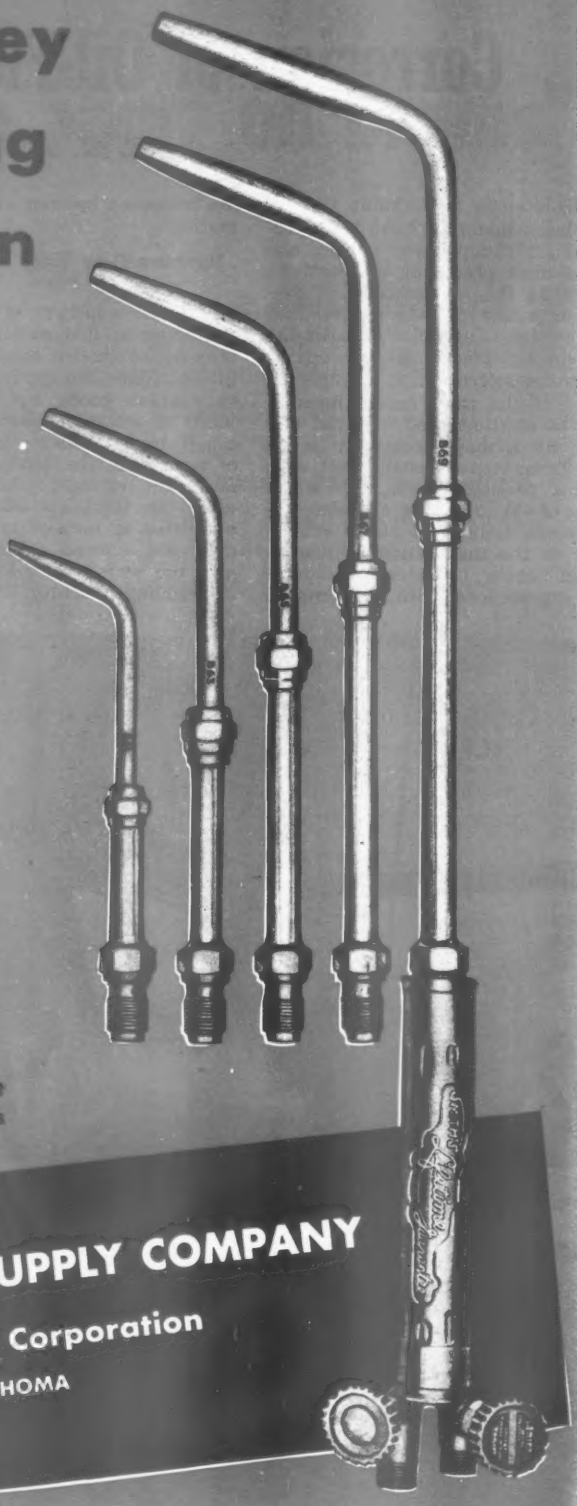


JONES & LAUGHLIN SUPPLY COMPANY
formerly
Frick-Reid Supply Corporation
TULSA, OKLAHOMA

Fig. 4: Portion of plant interior for dipping and preheating. Huge oven for baking plastic to equipment is shown at right end of building

stand the impact blows to which field equipment is subjected in ordinary handling. Tests have shown this material to possess an extremly high dielectric strength.

One of the most important steps in the process of coating oil-field equipment with the corrosion-protective plastics, is the thorough cleaning of the equipment. The Tube-Kote plant, where plastic coatings are applied, is equipped to completely remove calcium magnesium sulfate from used fittings, and incrustations of oil, paint, calcium magnesium precipitates and other foreign materials from tubular goods. The parts of equipment subject to corrosion are sand blasted. For example, an operator might specify that inside protection only is required in a string of pipe. Since the plastic is applied by dipping, both the inside and outside of pipe will be coated; however, under such conditions only the surface exposed to corrosion would be sand blasted. Thus the cost of applying a plastic coating to pipe, when only inside protection is necessary, is somewhat less than if it were necessary to sand blast both inside and outside surfaces.

The complete process of applying the plastic coating to a joint of pipe requires 8 hours. This time includes pickling, sandblasting, dipping, preheating and baking.

Four separate coats are applied to pipe and other equipment by mass dipping into a vat holding 4,800 gal. plastic. Each of the first three coats is baked in an oven at 300° F. for a period of 30 minutes. The last or fourth coat is polymerized by a baking time of 2 hours, also at 300° F.

Thin Coating Gives Best Results

The four applications of plastic material leaves a 0.005-in. coating on the equipment. While this may appear to be a rather thin coating, it should be pointed out that the protection to pipe and other equipment is due to the imperviousness of the plastic, rather than the thickness.

In the case of pipe lines, the plastic coating has advantages other than the protection afforded against corrosion. The surface of the plastic is extremely smooth, having a coefficient of friction approximating that of glass, and its use should afford an appreciable reduction in pump pressures. During wet-and-dry seasons pipe lines are subjected to soil stress, and it is reasonable to assume that the plastic coating on the outside of the pipe should result in a lower soil stress. Due to the high electric strength of plastic-coated pipe the pH values in different types of soil can be easily controlled.

Drilling-Mud Programs

(Continued from page 55)

in a good hole, the hazard of fishing long strings of collars is largely eliminated. In the Gulf Coast area, where conditions are far more hazardous than in the Mid-Continent, three collars are in common use and six collars are not uncommon. The use of collars is advantageous since the weight on the bit is more easily controlled. With drill pipe in compression much of the weight thought to be on the bit is absorbed in wall friction. To remove this limitation, at least one oil-field shop is presently field testing a free-floating splined sub that permits operation of the drill pipe in tension with the weight of the collars on the bit.

The actual hole diameters in the shale sections at West Edmond are not accurately known since no caliper logs have as yet been run. Enlarged shale sections are evidenced by large shale piles and also by the fact that when going in to fish drill pipe with a knuckle joint and wall hook, it has been possible to pass by the top of the fish from 120 to 140 ft. before contacting with the drill pipe. In fact, it has been necessary in several instances to run electric surveys to locate the top of the fish since it was lying in a caved section and could not otherwise be found.

Cleaning Caved Sections

Once caved shale sections are permitted to develop, they result not only in mechanical difficulties but also in increased mud expense. Field investigation has indicated that caved sections can be effectively cleaned by lowering gel strengths in conjunction with increased viscosity or by increasing viscosity alone. Treatment to effect these changes results in increased mud expense. The addition of bentonitic clay is necessary to increase mud viscosity sufficiently and to obtain carrying power in the low velocity caved sections of the hole. Recent investigation has indicated that a mud of 49 cp. decreases the slip velocity of cuttings 40 per cent over the slip velocity in a 15-cp. mud and mud of 53 cp. decreases the slip velocity an additional 20 per cent. Other investigations have also shown that increased mud viscosity decreases the slip velocity of cuttings. Since slip velocity is the relative rate of settling of particles in fluids, it is necessary, if cuttings are to be removed, that the slip velocity be low in caved sections where the upward velocity is low. Thus it is apparent that caved sections should be eliminated in so far as possible.

In conclusion, it is believed that consideration of the following points will result in increased drilling efficiency and reduced costs:

1. Careful selection of all makeup waters.
2. Keeping hole filled when making trips.
3. Prevent enlarged shale caves by low water loss muds and/or drilling with drill pipe in tension opposite sections.
4. Using good judgment in the mechanics of coming out of the hole prior to coring, drill-stem testing, and electric logging.

Acknowledgment

Appreciation is expressed to R. B. McCloy and H. M. Northcutt, of Stanolind Oil & Gas Co., Tulsa, for help in constructing the model (Fig. 3) used in demonstrating the effects of running drill pipe in compression and for able assistance and suggestions in discussing the problem of excessive drilling weights. Appreciation is also expressed to E. E. Huebotter and R. V. Pendergrass, of Baroid Sales Division, for their work on water analysis and for preparing the data used in the various figures.

Proper Maintenance and Equipment Economies Are Stressed at North Burbank

by Kenneth B. Barnes

IN the current North Burbank gas-repressuring program are involved a total of 1,916 wells on 180 leases. Because average well production is only 6 bbl. per day, and with one-half of the active producers making but 3 bbl. per day or less, proper maintenance, economic equipment, and efficient operating practices are definite necessities. This is accentuated by the fact that the original development of the field took place in 1921-1926, or approximately 20 years ago, and consequently the installations lack many modern features in design and construction. Nevertheless, the properties have been maintained in excellent condition and numerous changes and practices made at small cost to assist in realizing full benefits from the gas return work.

Last week's issue of The Oil and Gas Journal, page 62, an article called attention to the 15,000,000 bbl. of additional oil obtained from the gas drive to date, with prospects for 35,000,000 bbl. more by continued operation under the method, plus a possible further reserve of 250,000,000 to 325,000,000 bbl. by application of artificial water-flooding practices. A number of recent pictures taken at various points through the field, together with brief discussions of features of interest, are presented here.

Fig. 1—Gas Input Well Conversions

All but a score of the 298 input wells have been converted from former oil producers. Tubing has been removed and the gas is injected directly into the casing. Laterals from main-line gas systems (carrying 40 to 300 p.s.i. pressure) are of 2-in. size, with a check, control valve, and recording orifice meter set near the well. Sometimes the old pumping derrick is left standing, to be used with bailing or clean-out tools whenever cavings must be removed.

Fig. 2—Portable Workover Equipment

The small production per well necessitates, for both oil and input wells, limited expenditures for workover jobs as they come up. Portable cable-tool units, truck-mounted, are used which can be moved in on a location, rigged up, and be in operation in a few hours' time. On some equipment a telescoping mast is incorporated which, in traveling position, lies flat across the unit.

Fig. 3—Supplementary Gas Purchased

At North Burbank the gas repressuring was started after the pool had reached practically a stripper stage, and insufficient gas was available for adequate results from available residue alone. Presently about 8,000,000 cu. ft. per day are being purchased from outside the pool, with increased rates needed

for the future. Photograph shows a 16-in. gas pipe-line loop now being brought into the field. Coating of the outside has been finished and the end blanked preparatory to lowering and testing.

Fig. 4—Rod-Line Pumps Fitted With Drains

Many of the leases pump their oil from stock to pipe line with rod-line pumps connected to the powers, and the photograph shows a newly installed unit. The stuffing boxes will gradually develop slippage and oil leaks, and here an underlying welded trough is connected to a half-buried steel drum which receives the crude oil as it accumulates. The air bleeder from the pump also is connected. A valve on the pump suction may be opened and the oil in the drum pumped out; a bayonet gage stick is fixed to the drum for finding the oil level.

Fig. 5—Central Powers Carefully Balanced

Pumping time of North Burbank wells varies from ½ to 24 hours per day. Central power installations are used exclusively, except on the northwest edge which produces water up to 250 bbl. per day per well (average about 25) and in the long narrow Stanley Stringer belt paralleling the east side. Powers serve one to two leases and are balanced to the best possible extent. Enclosing fence guards are used because of the range country. All equipment is carefully maintained because the future service job may extend for 50 years.

Fig. 6—Six Absorption Gasoline Plants

Six absorption gasoline plants are located at various points in the pool and are an integral part of the repressuring. Most of the plants operate at 40 to 50 p.s.i. absorber pressure. Accumulated production is over 1 billion gallons. All of the gas after plant fuel and extraction losses, less field fuel requirements, is returned to the producing formation. Some plants have several compressors for boosting the residue from absorber outlet pressure to about 275 p.s.i. for injection in the low permeability areas. Some of the plants are interconnected so that during peak pressure loads the gas can be switched to another system, thus eliminating venting of residue.

Fig. 7—Individual Pumping Units

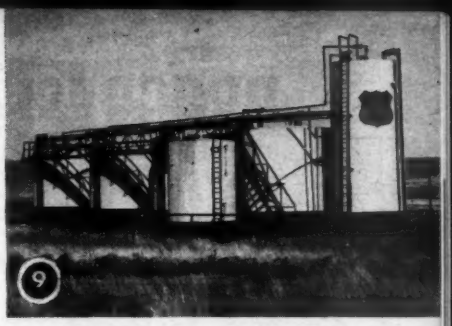
Photograph shows a new pumping installation in the Stanley Stringer area under test. In the view, left to right, are J. A. Gray, district engineer, Gulf Oil Corp.; W. K. Lawrence, district superintendent, Phillips Petroleum Co., and W. H. Bettes, district superintendent, Gulf Oil Corp.

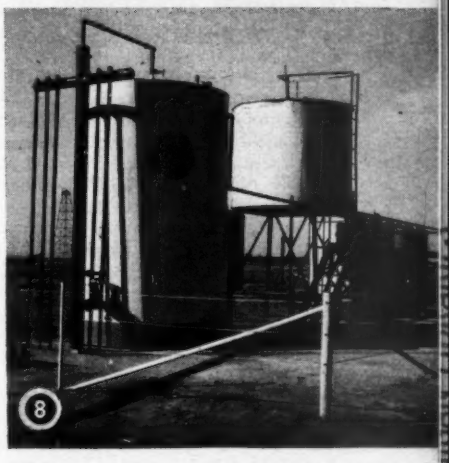
Fig. 8—Individual Well Testing

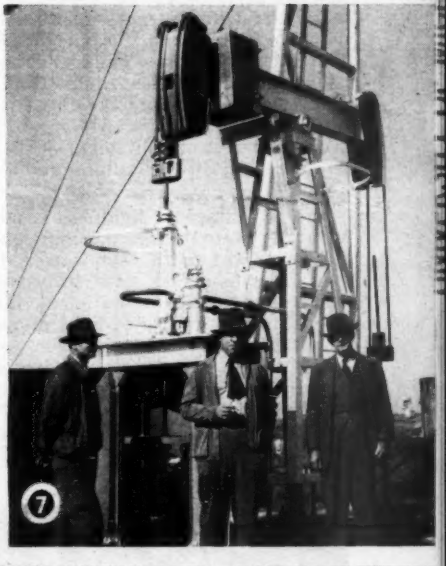
Photograph shows tank battery of a small six-well property equipped with individual oil lead lines. The receiving tank in the foreground is 200 bbl. in size. The elevated test tank is of 100 bbl. size, and connected to the lead line manifold. The syphon from the receiver leads to a 10-bbl. salt-water tank (right-hand edge visible) where scale and b.s. are accumulated and withheld from the line carrying salt water to the disposal well. The two stock tanks are each 60-bbl. size. Lease is in northwest portion of pool.

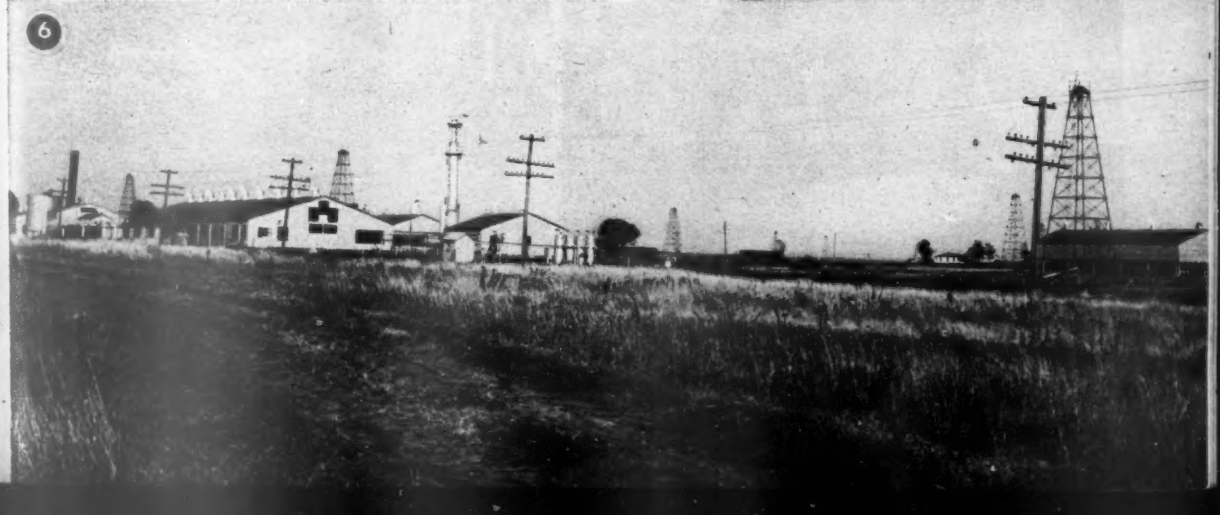
Fig. 9—Consolidated Tank Batteries

There is but a single royalty interest in Osage County, and consequently production from grouped or blocked tracts can be run into one storage battery. In the picture the 315-bbl. receiver (right) and four 685-bbl. stock tanks are handling production from 104 wells. Other consolidated batteries in the pool are serving groups of 22, 28, 30, 36, 46, 69, and 292 wells. Groups of test tanks ahead of the consolidated batteries permit tracing down fluctuations in production. By central gathering, in cases, crude oil gravities have been increased 1° to 2° A.P.I.









PROGRESS IN METALS

by W. L. Nelson
Consulting Engineer

Aluminum Tanks and Field Equipment

THE light weight of aluminum and/or magnesium alloys makes these metals notably suitable for tanks, cylinders, containers, barrels, drums, etc., that are to be used on portable equipment. In the case of aircraft, the usefulness of light alloys is obvious. Much the same advantage is apparent with any rolling stock or movable equipment, but until quite recently the cost of such alloys has been a deterrent to their use. Now that enormous facilities are at hand, the production of aluminum and magnesium alloys can be put on an increasingly competitive basis, particularly in those services where the lightness or corrosive resistance of these alloys is outstandingly useful. Tank trucks, fuel tanks, movable field tanks for chemicals, containers, drums, cylinders, or packages used for the regular transport of oils (particularly when not used for standing storage) are certainly services which might justify an increased use of aluminum alloys.

The advantage of lightness is not faithfully stated if the original saving in weight is all that is considered. In connection with transportation equipment, an initial saving in weight by the use of light alloys is reflected in smaller power requirements, less inertia, lighter brakes and wheel construction, lighter support frames, and finally greater freedom from vibrations (or fatigue) because of the greater stiffness of aluminum constructions. From this standpoint, the petroleum industry might well consider the use of aluminum for such movable field equipment, as portable derricks, cleanout equipment, well-servicing equipment, winches, and even parts of drilling equipment not subject to heavy duty.

In sour-oil storage tanks corrosion occurs on the underside of the roof by contact with hydrogen sulfide, air, and moisture. The droppings from a steel roof are particularly harmful because they lie in the bottom of the tank in the salt brine and produce deep pits in the bottom plate. The use of aluminum roofs to avoid this difficulty is not new, but the cost of such roofs has heretofore been prohibitive. Now that the cost of aluminum has dropped from over 20 cents per pound in 1934 to under 15 cents in 1945, and with even lower costs in prospect, it is probable that aluminum roofs (and walls to a point lower than the customary vapor-space) will become common practice for the storage of sour crude oils or similar products in refineries.

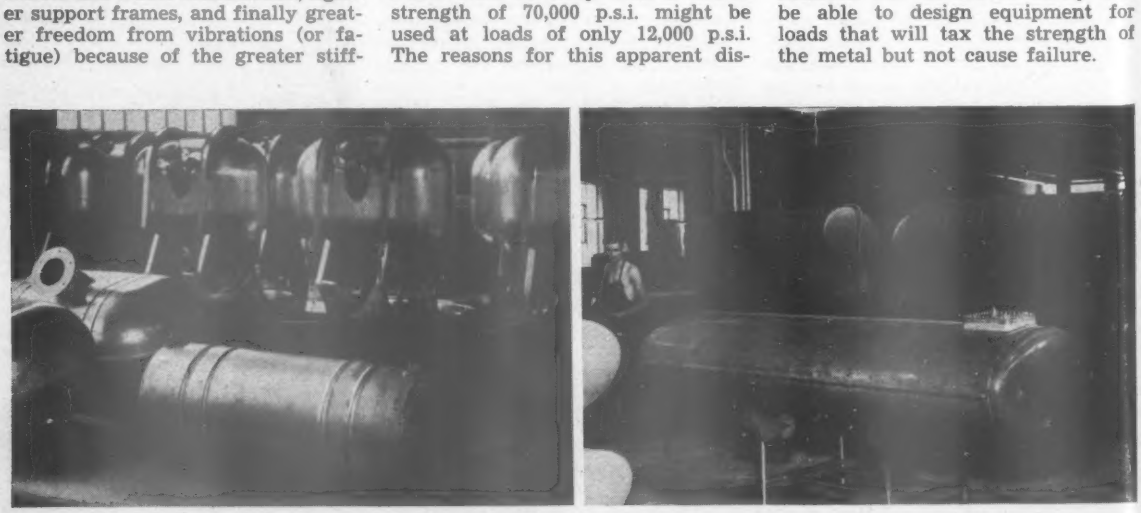
Factor of Ignorance Being Replaced

ENGINEERS have frequently been embarrassed by comments on the use of a factor of safety of 5 or even more. Thus an alloy with a tensile strength of 70,000 p.s.i. might be used at loads of only 12,000 p.s.i. The reasons for this apparent discrepancy are well understood by most engineers but in the past there has been a lack of specific knowledge and hence engineers could only be conservative in their designs. The derisive comment of laymen that the factor of safety was really a factor of ignorance, had some foundation.

Research laboratories have tackled the situation with ever-increasing vigor and now we have more data on fatigue strength, corrosion fatigue resistance, creep strength at elevated temperatures, damping capacity, impact at low temperatures, and other properties at high and low temperatures. These additions to our knowledge of physical properties are beginning to bear fruit in our designs of oil pipe stills, boilers, aircraft, automobiles, etc. Particularly in the design of aircraft, each pound of weight requires additional wing area and horsepower to support it in flight. Obviously, such equipment must be designed at a safe margin in order to save human life but the design strength cannot be far from the maximum or failure strength or the aircraft rapidly loses its usefulness as a machine. Somewhat the same situation exists in the drilling operations of the petroleum industry except that here the penalty is a stiff economic one rather than that of human safety.

The recent increases in railroad wrecks are due in large part to fatigue failure. Defects in rails last year were 40 per cent more numerous than the previous worst year, according to an engineer for a rail-testing service. His opinion that "about 99 per cent" of these defects were the result of fatigue shows that manufacturers' quality was little at fault, that the many heavy and repeated loads of the war were causing fatigue failure.

Let us hope that we can soon abandon our factors of safety and be able to design equipment for loads that will tax the strength of the metal but not cause failure.



Left: Aluminum alloy carboys (in frames) and small tank. Right: Various aluminum-alloy oil tanks. (Benson Manufacturing Co.)

Evaluation of Plant "Fire-Control Index"

*by R. L. Davis**

More than 10 years' practical experience in handling and processing refinery gases at southern and middle western refineries of Shell Oil Co., Inc., give the author of this analysis of refinery-fire prevention abundant first-hand data from which to draw his conclusions. He started work for Shell at the Norco, La., refinery shortly after graduating from Louisiana State University in 1932 with a degree in chemical engineering. He became motor-testing engineer and was later made head of the Norco gas department. He became assistant head of the gas department at Shell's Wood River, Ill., refinery in November 1933. He was appointed head of the alkylation department at Wood River in October 1943, and remained until his transfer last July to head the gas department at the Houston refinery.

TODAY in refinery design one of the hardest questions for the engineer to answer is how vulnerable will this or that unit be in case of fire and how far should we go in providing fog nozzles, emergency dropouts and other emergency facilities.

The basic reason for this question being so hard to answer is that there are three important unknowns:

1. How often will we have an emergency?
2. If it does happen, how severe will it be?
3. How does the hazard of this plant compare with other units?

Inasmuch as the above questions cannot be answered in numbers, we would logically expect widespread disagreement in how to prepare for an emergency and how much to spend on it. At this point in safety equipment design there is some tendency to be optimistic inasmuch as there is always a shortage of detailed specific evidence that we should be pessimistic.

As opposed to this there is something annoying which keeps confronting everyone and that is the fact that we know some time there will definitely be emergencies and some of them will be severe.

The answers to the above three questions have also been made more difficult by the rapid growth of volatile recovery and catalytic processes during the past few years. In topping and cracking operations we have considerable history to lean on for safety advice. In many of the newer processes, such as HF alkylation and isomerization, history is now being made.

Percentage Frequency of Hazards

It is also to be remembered that it is dangerous to base opinions too much on history for any short period of time, such as 2 years or so, when observing a comparatively small number of units and watching for an incident which could only be tolerated a very small fraction of the time. Observing 10 units for 700 days will not give a sound indication of what the percentage frequency of hazards will be. If we were dealing with 1,000,000 units and high incidence of the variable, then only a few days' observation would, of course, give significant data.

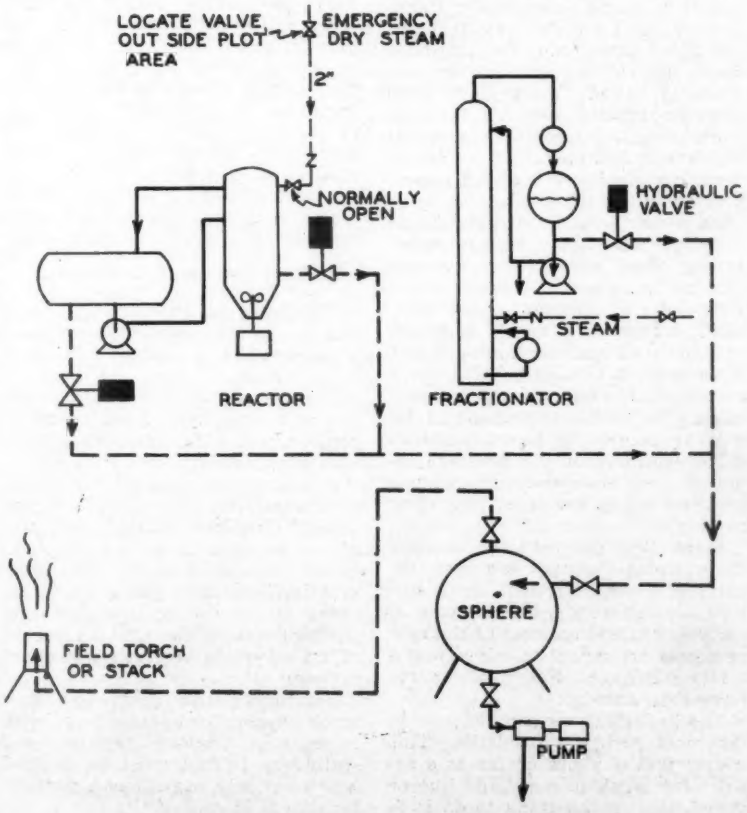
In the absence of concrete information gained from extended experience on these type plants, only small efforts have generally been made to provide safety facilities on new plants. Those that have been provided are patterned after conventional facilities used on atmospheric fractionating units. This usually means several steam hoses (worthless for large volatile fires), several foam outlets in the area and the conventional high-pressure water hydrants.

It is the writer's belief that some measure can be made of the relative degree of hazard presented by individual units within a refinery and that a numerical value can be given this measure. For want of a better name it can be called the "Fire Control Index" of a unit. The present work is merely an idea and its development to a useful design tool can result only from the combined effort of many experienced petroleum engineers.

History of Fire Problems

Before discussing the development of the "Fire Control Index" idea, it is of some interest to review briefly the history of refinery fire problems.

Up until 1925 oil refining meant principally distillation. Nearly all



Suggested arrangement for hydraulic dropout system on alkylation reactor and fractionating column

*Head, gas department, Shell Oil Co., Inc., Houston.

equipment operated at pressures near atmospheric. Gasoline was the most volatile and, therefore, the most hazardous product handled, and even it could be safely stored in atmospheric tanks. Corrosion, as compared to our chemical corrosion problems of today, was negligible. In this period one of the biggest worries was tank fires. Foam soon became the answer for these. Very few refineries kept as much as 100 bbl. total of any volatile as light as propane or butane in the entire plant. In those times everything handled in a refinery was nonvolatile enough so that if it should ever catch afire, the wise thing to do was to cool the oil and extinguish the blaze.

From 1925 to 1935 cracking processes employing high temperatures and pressures advanced very rapidly. The development of alloys and methods of metal fabrication hardly kept pace with demand and consequently in the early days many serious cracking fires were experienced.

Safety Restored

Engineering and metallurgy soon caught up with demands and today cracking operations are probably one of the safest processes there is in any refinery. It may also be added here that thermal cracking has been stabilized and so completely standardized until we can say that the last development bug has long been dead. Also as a result of frequent disasters in the early days very efficient remote dropout facilities were provided for cracking plants which enabled operators to empty them completely of hydrocarbon in a few minutes if need be.

As a carryover from early cracking days there has been a tendency among some operators to overemphasize the hazard of pressure. Pressure alone is, of course, not significant. A leak on a vessel operating at 5,000 p.s.i. and containing 1 bbl. of propane is cause for little worry compared to a leak on a vessel containing 1,000 bbl. of propane at 200 p.s.i. It is also to be remembered that regardless of the pressure involved, we always design with a pressure safety factor of from four to five.

From 1935 up until the present, the refining industry has seen the greatest scientific growth in its history. Unfortunately, like the case of early-day cracking, most of the new processes are meant to solve from a safety standpoint. Nearly all factors have been adverse.

The hydrocarbons handled are, in the most part, quite volatile. This means that if a fire occurs as a result of a break in a volatile line or vessel, the unwise thing to do is to extinguish it until the source of the burning hydrocarbon can be stopped. The whole question of emergency measures resolves itself into this question: how easily can, or cannot the source of the fuel be shut off.

Most of the newer processes, particularly alkylation, polymerization, and isomerization, employ poisonous catalysts which make the handling of products from gasket failures, broken lines or other sources most difficult. Usually the catalysts in addition to being poisonous are very corrosive which enhances both the frequency and severity aspect of the emergency. The nature of the new processes has called for extensive instrumentation necessitating many additional valves and fittings; extensive use of recycling, mixing, and settling which means more pumps, lines and vessels and a more vulnerable plant.

We are today at a point in modern refinery equipment safety design similar to where cracking design was in 1925.

No matter how optimistic we may want to be it is necessary that everyone take a realistic viewpoint and remember that accidents will happen as long as humans inhabit the earth, and as long as they design and operate mechanical equipment.

With this assumption we must then plan and be prepared for emergencies when accidents occur. As stated earlier, prudence demands that we assume sooner or later there will be packing or fitting failures on any plant. On an alkylation or isomerization unit, we can expect such a failure to result in the escaping of appreciable quantities of chemicals and hydrocarbons. We must also assume that the break may be at a point where (1) there are no facilities for blocking off the leak and (2) that valves which could be used for a block are inaccessible.

Two Emergency Measures

There are only two things which can be done to any advantage once a severe fire is under way on a volatile unit:

1. Direct adequate water fogs into fire and on adjoining equipment to remove heat which may prevent the spread of the fire.

2. Remove or shut off the source of the burning hydrocarbon. If secondary fires have started, it is usually impossible to isolate effectively all recycle lines, etc. The most practical approach would be to remove all of the hydrocarbon and chemicals from the unit by means of an adequate emergency dropout system.

Before we can decide on how much to spend or how far to go with emergency dropout systems and sprinklers, it first must be decided how relatively hazardous a particular unit is in case of fire.

There are five major factors which particularly affect the hazard of a unit in case of fire and are to be considered when plant protection is being designed. These are shown below and the numbers shown represent values arbitrarily given on the basis of the author's experience:

	Assumed base value for each factor (%)
1. Hydrocarbon concentration per unit area	25
2. Volatility of hydrocarbon	20
3. Plant value or investment factor	25
4. Chemical hazard and corrosion factor	10
5. Proximity of other equipment which may be endangered by fire	20

Assume the following hypothetical plant (having a "fire control index" of 100) for establishing base factors.

A hydrofluoric alkylation plant covering 40,000 sq. ft. containing 4,000 bbl. of butane, 1,000 bbl. of hydrofluoric acid, the reaction system steel weighs approximately 225 tons and the total plant is worth $2,000,000 — assume also that the plant is crowded on all four sides with other operating equipment. Of course, this plant is assumed not to have any emergency facilities since the desirability and necessity for these are what we are trying to solve.

To evaluate the degree of vulnerability in case of fire of any plant, relative to our example plant, the following five formulas can be used. The sum of the values obtained from solving the five will give the "Fire Control Index" or F.C.I. The constants used in these formulas were solved so as to give a value equal to the factor value shown in the above table for the hypothetical plant. These formulas, using the constants given, can be used for determining the F.C.I. of any plant.

1. Concentration factor =

$$\frac{\text{Total bbl. hydrocarbon in unit}}{\text{Plant area (sq. ft.)}} \times 250$$

2. Volatility factor =

Average vapor pressure of hydrocarbon in plant × 0.5.

Note: If vapor pressure is above 40 lb., use only 40 lb.

3. Investment factor =

$$\frac{\text{Plant value in dollars}}{\text{Plant area (sq. ft.)}} \times 0.5$$

4. Corrosion factor =

$$\frac{\text{Total reactor weight (tons)}}{\text{Bbl. corrosive chemicals in unit}} \times 45$$

5. Spread factor =

$$\frac{400 - (A+B+C+D)}{20}$$

Note: In No. 5, the assumption is

made that an ideally safe plant should be 100 yards on each of the four sides from other valuable operating equipment. Thus, the constant 400 in the above formula, A+B+C+D, represents the actual sum of the distance in yards for the four sides from other operating equipment for any plant in question.

In our example plant we get:

$$\frac{400-0}{20} = 20$$

since we assumed that the plant was crowded on all four sides.

If we substitute the data obtained in the description of our hypothetical plant in the above formulas we get a total of 100.

The question of how close a furnace should be to an operating unit often arises. This is debatable, however, in general, it can be assumed that if there is a serious volatile leak which cannot be shut off, the sooner it flashes the safer it is. On the other hand, we would not want the furnace so close that it interfered with the safety of routine sampling, bleeding pumps, small leaks, etc. A distance of 50 yd. could be set as a reasonable distance.

When the "Fire Control Index" of a plant has been determined (disregarding emergency equipment) then we have something tangible to tie to for directing the design of the safety equipment for the plant in question.

Sprinkler Facilities

If we make the rough assumption that sprinkler facilities should be designed elaborate enough to keep all of the steel cool for a time and that a remote dropout system should be adequate for disposing of all hydrocarbon in the plant within 30 minutes, we may be close if we use the following formula for determining the cost of the emergency safety facilities.

5% × "F.C.I." × plant value

Using our hypothetical example plant again we get:

$$\frac{0.05 \times 100 \times \$2{,}000{,}000}{100} = \$100{,}000$$

For another example we will work out the F.C.I. for a conventional topping unit.

1. Area, 30,000 sq. ft.; plant contains 800 bbl. of hydrocarbon.
2. Average volatility of hydrocarbon = 5 lb.
3. Investment = $1,500,000.
4. No chemicals.
5. Proximity of other equipment: On four sides other units are within 50 yd., 75 yd., 75 yd. and 20 yd.

Solving:

1. Concentration factor $= \frac{800}{30{,}000} \times 250 = 6$
2. Volatility factor $= 5 \times 0.5 = 3$
3. Investment factor $= \frac{1{,}500{,}000}{30{,}000} \times 0.5 = 25$
4. Corrosion factor $= 0 = 0$
5. Spread factor $= \frac{400-(50+75+75+20)}{20} = 9$

Total (or F.C.I.) = 43

Therefore: $\frac{0.05 \times 43 \times 1{,}500{,}000}{100} = \$32{,}000$

$32,250 represents the amount, according to this work, that can be justified for emergency safety facilities.

Maybe 5 per cent in the above formula is too high, or too low. However, there exists a percentage somewhere that is correct.

Shutdown Time Saved

An important consideration of the benefits which are derived from complete dropout facilities is the time saving affected on maintenance shutdown. It is quite likely that a dropout system complete enough to empty a unit in 30 minutes would pay for itself during the first year by shortening the maintenance shutdown time.

After it has been decided how much to spend on fire control facilities, the next question is how to spend it. It is beyond the scope of this paper to go into detailed engineering design; however, a brief description is given here of what some experienced operators believe to be adequate facilities.

The 5 per cent as used in our formula was selected because it is believed that for the average refinery this amount will cover the cost of necessary fire control equipment. In general this would be to:

1. Provide piping to carry exhaust gas or liquid hydrocarbon from relief valves to a header and thence to a field torch located at a safe distance from the refinery, say 200 or 300 yards from operating equipment. (The expense of this item should not include the cost of the relief valves inasmuch as there is no option concerning the purchase of these.)

2. Provide adequate water fog nozzles in pumphouses, over vessels and around structural steel. There is still some question as to how large a water fog system should be; however, a good start would be to provide facilities for converting 1 g.p.m. of water to fog for each 10 sq. ft. of pumphouse area or other area where there is a concentration of steel equipment. (This would not necessarily mean 1 g.p.m. for every 10 sq. ft. of plot area as used in the "concentration factor" formula.)

It is highly advisable to install equipment which will deliver a definite fog and not merely a sprinkler system. Water that reaches the floor does not remove heat.

3. Provide remotely operated dropout valves, headers and receptacles to permit emptying all hydrocarbon from a plant in 30 minutes. Thirty minutes is chosen arbitrarily as a feasible length of time for a completed dropout. It is a compromise between time, cost and line sizes.

Dropout Systems

On units containing hydrocarbons heavier than pentane, the usual cracking unit dropout system is adequate and proved. Generally, this consists of remote dropout valves, headers, and a dropout receptacle so constructed that the hot oil received is quenched with water.

For units containing substantial quantities of propane or butane, and maybe a corrosive chemical, it is not feasible in most cases to drop this material to an atmospheric pit. Note: An atmospheric pit could probably be used if it were isolated enough. If used it would be imperative that the material be ignited as soon as dropped out. The disadvantages:

1. System not practical for use on routine maintenance preparations (a very important disadvantage).
2. Large loss of hydrocarbon.
3. Hazard if dropout is not immediately ignited.

A better arrangement for volatile dropout is to terminate the dropout header in a pressure vessel large enough to hold the entire plant content. Normally the top of this vessel would remain open to the field torch with a block valve at the top of the tank.

On plants like alkylation units containing 4,000 bbl. of hydrocarbon and acid, a 5,000-bbl. pressure sphere would be recommended.

A refinery having three separate volatile plants containing separately say 2,000, 3,000 and 5,000 bbl. of hydrocarbon, might for example, use a 6,000-bbl. sphere as a common dropout receptacle.

It is realized that there will be differences of opinions among refiners as to the relative weights to be assigned the various hazard factors and the maximum expense which can be justified for protective installations. It is felt, however, that the method of analyses suggested provides a logical approach to the solution of the problem and it is hoped that the suggestion will stimulate interest in providing much-needed safety in modern plants which will of necessity store large volumes of volatiles in operating areas.

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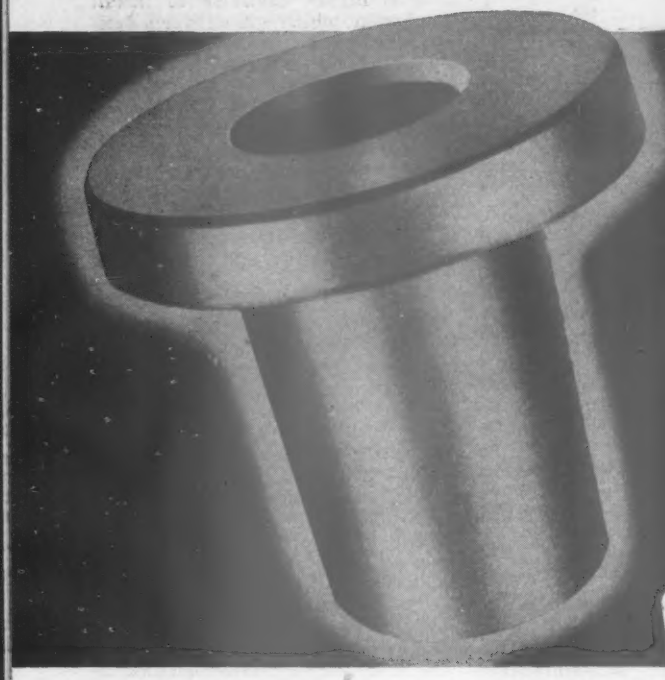

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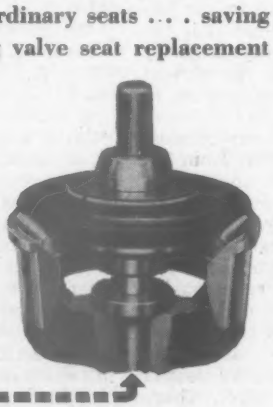

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Permeability, Type of Pay, And Interstitial Water

Mechanics of Producing Oil, Condensate, and Natural Gas

PART 5 OF A SERIES

*by Park J. Jones**

MEDIA that allow the passage of fluids through them are said to be permeable. The unit of permeability, the darcy, is defined in A.P.I. Code 27, using C.G.S. units. In this work permeability will be expressed in terms of barrels per day. An appendix to this article gives the conversion from C.G.S. units to:

$$K = \frac{0.887\,\mu\,QL}{A\Delta P} \qquad (1)$$

where

A = cross-sectional area, sq. ft.
K = permeability of media, darcys
L = length, ft.
ΔP = pressure difference, p.s.i.
Q = rate of passage of liquid, bbl. per day.
μ = viscosity of liquid, centipoises

According to Equation 1, a rate of passage of 1 bbl. per day of a 1-centipoise liquid through a 1-sq. ft. area under a pressure gradient of 1 p.s.i./ft. equals 0.887 darcys or 887 md. The permeability of media found in practice ranges from zero up to several million millidarcys. Permeability is a characteristic of media. The unit of permeability is, by definition, the rate of passage of fluids under specified conditions.

Permeability of Spherical Aggregates

The permeability of 0.002-in. uniform spherical aggregates is on the order of 2,000 md. The permeability of 0.01-in. uniform spherical aggregates is on the order of 40,000 md. The foregoing values are only rough estimates. The permeability of uniform spherical aggregates varies widely with packing.

Permeability of Solution Channels

The permeability of smooth circular solution channels is (see the appendix to this article) defined by:

$$K = 20{,}000{,}000\,D^2 \qquad (2)$$

where

D = diameter in inches
K = permeability in darcys

The permeability of a smooth circular solution channel only 0.01 in. in diameter is on the order of 2,000,000 md. The permeability of solution channels accounts for the extremely high potentials of some limestone and dolomite wells.

*Production consultant, Houston.

Formations that permit flow of fluids through them are defined as being permeable. In this work permeability will be treated in field units. Aside from the use of tracers, three methods are available for estimating interstitial water in pay: (1) From electric log data, (2) from type of pay and its permeability, and (3) from water saturation data at various capillary pressures. Only items (2) and (3) are discussed in this article. Electric-log data will be considered in a later article.

Permeability of Fractures and Stylolites

The production into some wells is displaced through fractures, joints, cracks, and stylolites. The permeability of such openings may be estimated roughly (see the appendix to this article) with the aid of the following equation:

$$K = 54{,}000{,}000\,W^2 \qquad (3)$$

where

K = permeability, darcys
W = width, in.

The permeability of a smooth fracture or stylolite only 0.01 in. wide is on the order of 5,400,000 md. Fractures and stylolites account for millions of barrels of oil reserve which could not be produced commercially if such secondary openings did not exist.

Methods for Estimating Interstitial Water

The interstitial water in core samples of pay, when not contaminated by drilling fluid, equals the water saturation in the core samples. Whereas the total water saturation in contaminated core samples of pay is usually greater than their interstitial water content. The extent of contamination commonly ranges anywhere from zero up to 30 per cent of porosity. Tracers may be used for estimating the degree of contamination. Aside from tracers, three methods are available for estimating interstitial water in pay: (1) From electric-log data, (2) from type of pay and its permeability, and (3) from capillary pressure vs. water saturation data. Electric-log data will be considered in a later article. Items (2) and (3) are discussed below:

Water Saturation vs. Capillary Pressure

The interstitial water content at a given point in a pay depends (1) on the elevation of the point above its water contact, (2) on the characteristics of the pay at that point and (3) on the properties of interstitial water, and of the reservoir fluid in

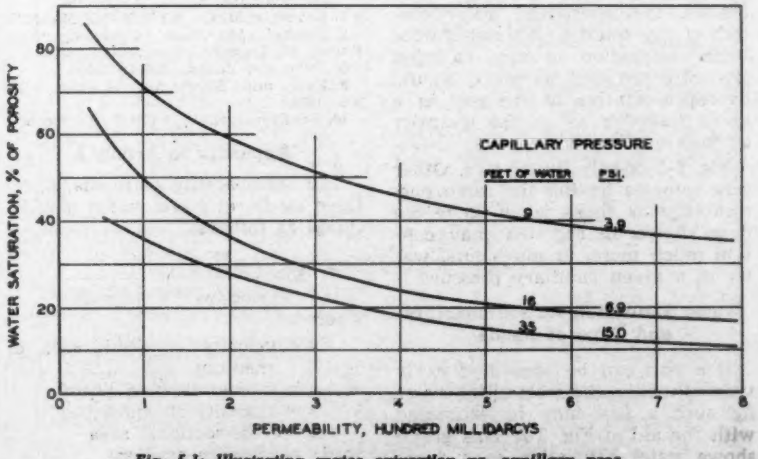


Fig. 5-1: Illustrating water saturation vs. capillary pressure for air-pure-water interfaces at various permeabilities

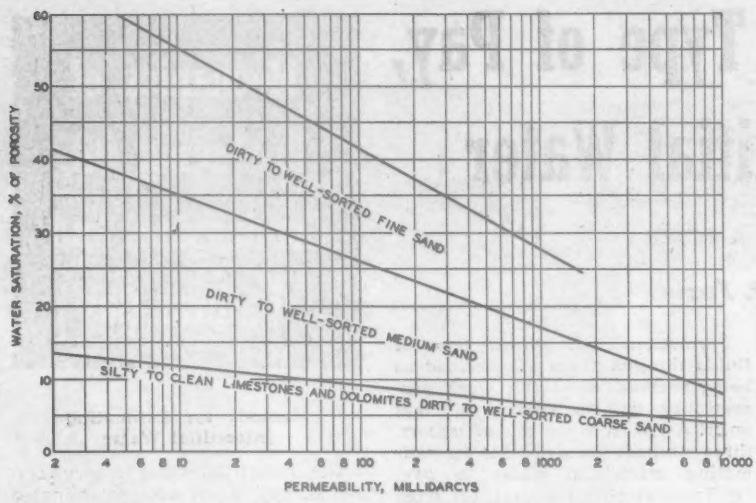

WATER SATURATION, % OF POROSITY
PERMEABILITY, MILLIDARCYS
DIRTY TO WELL-SORTED FINE SAND
DIRTY TO WELL-SORTED MEDIUM SAND
SILTY TO CLEAN LIMESTONES AND DOLOMITES DIRTY TO WELL-SORTED COARSE SAND

Fig. 5-2: Water saturation vs. permeability and type of media

contact with the water, at the prevailing reservoir pressure and temperature.

Assume that core samples are representative point data for pay. Let the core sample be saturated with pure water and then desaturated by capillary pressure. Air or gas may be used to displace water from the core samples. Fig. 5-1 illustrates the results obtained by the foregoing procedure on a number of core samples taken in one reservoir. The curves in Fig. 5-1 illustrate (1) that water saturation may vary with permeability for a given capillary pressure, and (2) that water saturation varies with capillary pressure for a given permeability.

In other words, the curves in Fig. 5-1 illustrate that water saturation varies with (1) elevation above a water contact, (2) characteristics of pay, and (3) properties of water, and of the fluid in contact with water, at the pressure and temperature prevailing in a laboratory. Therefore, if laboratory conditions could be corrected to reservoir conditions, the interstitial water content of pay could be estimated from water saturation in core samples. The core samples, however, should be representative of the pay in a given reservoir as to the quantity of each quality of pay.

Fig. 5-1 is only illustrative. Other core samples having the same permeability as those which gave the data shown in Fig. 5-1 may contain much more, or much less, water at a given capillary pressure.

Water Saturation vs. Permeability and Type of Media

If a pay can be identified as to type of media, the interstitial water for such a pay may be estimated with the aid of Fig. 5-2. This graph shows water saturation as a function of permeability for various types of media. Identification as to type of media is based on experience with (1) cores not contaminated by drilling fluids, (2) comparison with similar pay in other reservoirs, (3) correlation by capillary methods, and (4) correlation with electric-log data.

The interstitial water of most sandstone reservoirs falls in the region halfway up and down from the middle line in Fig. 5-2 to the top and bottom lines respectively. There are exceptions, however, depending on size of particles, degree of sorting, and type and quantity of bonding materials.

The interstitial water of limestone and dolomite reservoirs having secondary porosity is, as a general rule, less than 15 per cent of porosity even for exceedingly low permeability.

References

1. A.P.I. Code 27.
2. Botset, H. G., A.I.M.E., TP No. 972.
3. Hassler, Brunner and Deahl, A.I.M.E., TP No. 1623.
4. Johnson, N., A.P.I., 1941.
5. Klinkenberg, L. J., A.P.I., 1941.
6. Leverett, M. C., A.I.M.E., TP No. 1223.
7. Muskat, M., Flow of Homogeneous Fluids, McGraw-Hill Book Co.
8. Pyle and Jones, A.P.I., 1936.
9. Pyle and Sherborne, A.I.M.E., TP No. 1024.
10. Schilthuis, R. J., A.I.M.E., TP No. 869.

Appendix to Article 5

The permeability of media is defined by Darcy's law which may be stated as follows:

$$K = \frac{\mu v}{dp/dx} = \frac{\mu q}{a\,dp/dx}$$

where

v = velocity of liquid/area of medium
q = rate of flow of liquid
μ = viscosity of liquid
a = cross-sectional area
dp/dx = pressure gradient

If the permeability is constant over a distince l,

$$\frac{dp}{dx} = \frac{p_1 - p_2}{l} = \frac{\Delta p}{l}$$

and if q and a do not vary.

$$K = \frac{\mu q l}{a \Delta p}$$

The unit of permeability is called a darcy and is, by definition, equal to the rate of flow of 1 cc. per second of a liquid of 1-centipoise viscosity through a cross-sectional area of 1 sq. cm. under a pressure gradient of 1 atm. per centimeter and conditions of viscous flow.

For field applications, the darcy is defined in terms of barrels per day, pounds per square inch and feet. The conversion from C.G.S. units to field units is made with the aid of the following equation:

$$K = \frac{C \mu QL}{A \Delta P} = \frac{\mu q l}{a \Delta p}$$

from which

$$C = \frac{qL\Delta P}{ql\Delta p}$$

where

C = constant of conversion
Q = rate of flow in bbl./day
q = rate of flow, cc./second
L = length in ft.
l = length in cm.
A = area in sq. ft.
a = area in sq. cm.

as

Δp atmospheres = $14.73 \Delta p$ p.s.i. = ΔP
q cc./sec. = 0.5435 q bbl./day = Q
1 cm. = 1/30.48 ft. = L

it follows that

$$C = \frac{14.73}{0.5435 \times 30.48} = 0.887$$

and that

$$K = \frac{0.877 \mu QL}{A \Delta P}$$

which is Equation 1.

The pressure loss for viscous flow of liquids through circular cross-sections is commonly defined by:*

$$\Delta P = \frac{32 \nu VL}{D^2}$$

where

ΔP = pressure loss in p.s.i.
D = diameter of channel, in.
L = length of channel, ft.
V = velocity of liquid, ft./sec.
ν = viscosity in lb. sec. per sq. ft.

as

$\mu = 4.79 \times 10^4 \nu$, centipoises

and

$$V = \frac{5.615\,Q}{86{,}400\,A}, \text{ bbl./day/sq. ft.}$$

$$\Delta P = 4.34 \times 10^{-5} \frac{\mu QL}{AD^2} = \frac{0.887 \mu LQ}{AK}$$

*Croft, G. H., "Thermodynamics, Fluid Flow, and Heat Transmission," McGraw-Hill Book Co.

from which

$$K = 20{,}000{,}000\ D^2$$

which is Equation 2.

Buckingham† concluded from his experimental work on slots that for viscous flow that

$$\Delta P = \frac{12\nu VL}{W^2}$$

where W equals the width of slits in inches and from which it can be verified that

$$K = 54{,}000{,}000\ W^2$$

which is Equation 3.

†Eng. 115,225, 1923.

Petroleum Section, A.S.C., Elects New Officers

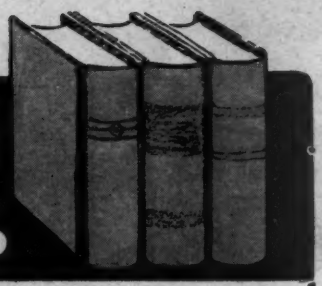
The Petroleum Section of the National Safety Council, Chicago, recently elected the following officers:

General chairman, John C. Askam, safety director, The Ohio Oil Co., Findlay, Ohio; vice chairman for production, D. A. Klemme, safety supervisor, Stanolind Oil & Gas Co., Tulsa; vice chairman for marketing, George Alexander, safety supervisor, Socony-Vacuum Oil Co., Inc., Boston; vice chairman for pipe lines, W. I. Kent, manager accident and fire-prevention department, Magnolia Petroleum Co., Dallas; vice chairman for manufacturing, A. J. Gorand, manager plant-protection department, Sun Oil Co., Philadelphia.

Secretary, D. V. Stroop, engineer, American Petroleum Institute, New York; news-letter editor, W. K. Bergen, assistant superintendent, Standard Oil Co. (Ohio), Toledo; associate editor, C. R. Sliger, manager safety department, Insurors Indemnity & Insurance Co., Tulsa; content and statistics committee chairman, J. Willard Lord, safety director, Atlantic Refining Co., Philadelphia.

Engineering committee chairman, L. F. Knox, safety engineer, General Petroleum Corp. of California, Los Angeles; health committee chairman, Dr. R. W. Pipkin, Humble Oil & Refining Co., Baytown, Tex.; industrial data sheet committee chairman, W. A. Allred, assistant safety supervisor, Lone Star Gas System, Dallas; on-the-job safety committee chairman, Roy S. Bonsib, safety director, Standard Oil Co. (New Jersey).

Visual education committee chairman, Frank Harrison, director of safety, Pure Oil Co., Chicago; Atlantic division chairman, P. J. Jolly, assistant to manager industrial relations, The Texas Co., New York; Great Lakes division chairman, Joseph C. Bernd, safety engineer, Sinclair Refining Co., East Chicago, Ind., and Gulf Coast division chairman, Crymes Pittman, United Gas Pipe Line Co., Shreveport.



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Control and Detection of Reservoir Gas Movement in Pressure-Control Operations

*by N. Van Wingen and E. P. Valby**

For pressure-maintenance work in fields having an overlying gas cap, increases in gas-oil ratio may mean that part of the injected gas is being produced. Tracers added to the injected gas is one means of determining the status. The authors present a method whereby analyses of production from a true gas-cap well and from a true flank oil well supply the data for calculation if injected gas of a known composition is present in production from a given well.

IMPORTANT natural agents for effecting oil recovery that may be available originally in a reservoir are gas, both dissolved in the oil and free in gas caps; encroaching water, and the force of gravity. Which of these agents will be dominant for any given reservoir at any stated time period is dependent upon local natural and operating conditions. Hence, it is possible for a pool to pass from one dominance to another.

Naturally occurring petroleum accumulation may exist either in a single phase or in two phases. Examples of the former are saturated or undersaturated oil (liquid phase only) or condensate pools (vapor phase only). A two-phase reservoir is one containing either gas and oil or oil and vapor, the latter case being exemplified by a condensate pool underlain by a dark oil zone.

For a single phase, liquid accumulation in a reservoir not subject to a water drive and consisting of sands so low in permeability that gravity drainage cannot be operative, the only natural energy available for recovery is that contained in the solution gas. As a result, a minimum recovery efficiency is to be anticipated for this type of reservoir. Conversely, the natural recovery efficiency will be a maximum when the solution gas energy is augmented by that contained in an overlying gas cap in a water-drive pool of sufficiently high permeability that gravity drainage can also be a factor.

Native reservoir energy may be augmented by the injection into the reservoir of either gas or water. It is evident that such a procedure should result in the attainment of a greater ultimate recovery. Operations of this nature may be resorted to early in the life of a field, in which event they are generally referred to as pressure-control operations. The terms pressure maintenance, as applied to a dark-oil reservoir, and cycling for a condensate-type pool, are also used.

An efficient utilization of gas energy is therefore essential to the attainment of a high ultimate oil-recovery efficiency, particularly in those instances of either natural or stimulated production where gas is the major source of expulsive energy. A knowledge of subsurface conditions adequate to effect an efficient control of gas movement within a reservoir is requisite.

Control of gas migration is complicated by the fact that reservoir sands are seldom homogeneous or of uniform permeability. Thus, in most instances, bypassing and fingering of gas will occur. This condition may be aggravated further by the existence of pressure anomalies due to a nonuniform production withdrawal pattern. Production of excess gas as a result of bypassing or fingering if unchecked, represents not only a loss in ultimate recovery due to this wastage of native reservoir energy, but may also cause the bypassing of substantial bodies of oil which after being denuded of their solution gas will remain nonrecoverable unless the pool is subjected ultimately to a water drive or to gravity drainage. When dealing with a field where the native reservoir energy is being augmented by fluid injection, bypassing or fingering introduces the additional factor of economic waste represented by the cost of handling and compressing fluid to replace produced gas which has performed but little useful work within the reservoir.

Migration of gas can be influenced by selective production or, in the event of pressure control or secondary-recovery operations, by the suitable location of injection wells and control of their injection rates. In view of the heterogeneity of most naturally occurring reservoir sands, however, this procedure will not suffice generally to control gas migration effectively over an extended period of time. Thus, whenever bypassing assumes significant proportions recourse has to be had, in most instances, to the performance of remedial work on individual wells for the purpose of shutting off the gas-bearing sand members. In this regard it may be highly significant if the source of the encroaching gas can be identified. If it can be shown, for example, that the gas being produced consists largely of bypassed injection gas, the situation may be remedied sometimes, and further gas expansion to other wells prevented, by changing the location of the injection well or by shutting off in the injection well the sand finger responsible for the bypassing.

Because of the need for means of detecting the migration of gas or showing that bypassing of injected gas is occurring, it is pertinent to explain the physical indications of gas migration, present means of detecting the presence of injected gas, and to describe briefly a method of well-effluent analysis to give the amount of reservoir fluids and injected gas in a well's production and a distribution of its gas production.

Physical Indications of Reservoir Gas Movements

The physical indications of gas or vapor-phase migration can be similar in nature for the liquid-phase reservoir or for the vapor-liquid-phase reservoir. However, these similar physical indications may be the result of different types of movement of gas or fluids in each type of reservoir. It is well, therefore, to consider the physical indication, as shown by increasing gas-oil ratio, changes in tank-oil gravity, and wet gas or well effluent composition for the various types of reservoirs.

Increased Gas-Oil Ratio

The first usual indication of the migration of gas is an increase in production gas-oil ratio; cubic feet of wet gas produced at standard conditions per barrel of tank oil.

In a single vapor-phase reservoir where a recycling process is being used, any migration of injected gas is reflected in the increased gas-oil ratio. However, this increase may not be proportional to the amount of injected gas being produced as its presence affects the retrograde condensation process by which the tank oil is produced.

*Richfield Oil Corp. A paper presented before the California Natural Gasoline Association.

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In a single liquid-phase reservoir an increased gas-oil ratio is an indication of the migration of liberated solution gas or injected gas. For the latter case, the actual increase may be due to either injected gas or the resulting enrichment of injected gas by contact with residual oil left in the interstices of the reservoir sands. In the first case, there will be reduction in the amount of tank oil, and in the second, an increase in tank-oil volume due to enrichment, per unit of original reservoir fluid.

In a two-phase reservoir, the increased gas-oil ratio can result from the movement of gas of two types, gas-cap fluid (either original or secondary) and injected gas, separately, or a combination of both, and even the enriched injected gas alone.

Due to the fact that the increased gas-oil ratio may be caused by a number of different types of movements, it is not possible to determine the cause, or approximate the amount of bypassed injected gas in the single liquid-phase reservoirs from gas-oil ratios alone. In a two-phase reservoir, it would be even more difficult to approximate the amount of injected gas being produced by a well.

Changes in Tank-Oil Gravity

A second physical indication of possible gas migration is shown by the gravity of the tank oil. Seasonal variations and surface trapping conditions affect the gravity of the tank oil.

Under cycling operations, the production of injected gas should result in a decrease of gravity of the tank oil due to the stripping effect at trapping conditions and its effect on retrograde condensation.

Pressure maintenance by injected gas in a single-liquid phase reservoir can result in an increased tank-oil gravity due to the stripping of volatile components of the residual oil at reservoir conditions, and mixing of these vapors with normal oil production. As this stripping progresses, the amount of volatile material will decrease and the gravity of the tank oil likewise decrease, eventually to that of the original tank oil. The gravity may even become lower due to this continued action, if the production of bypassed gas is not controlled. The first effect, increased gravity, may indicate the presence of a gas cap. Since for this type reservoir no original gas cap exists, qualitatively then, the increased gravity of the tank oil will confirm the migration of liberated solution gas or injected gas as indicated by the increased gas-oil ratio.

In a two-phase reservoir, an increased tank-oil gravity may also be the result of the expansion of the original gas cap to a well bore completed in dark oil phase. However, the increase may also be due to the stripping effect of the injected gas on the residual dark oil, thereby enriching it and make it appear that the increased gravity is due to gas-cap production. Thus, the increase in tank-oil gravity offers no means of showing what process is occurring.

Composition of Well Effluent

Injected gas used for pressure maintenance in a producing reservoir is in most cases residue gas from an absorption plant treating the wet gas produced by the reservoir. In such an event, there are no significant differentiating characteristics of the injected gas to aid its detection. If some other gas having decided differences in composition were used for pressure maintenance and the resulting produced gas were not recycled back to the reservoir, the changes in composition of the produced gas from that initially produced by the reservoir could be used to detect and determine how much injected gas was being produced. There are very few fields in which such a process of detection would be feasible.

The migration of gas-cap fluid or injected gas to a well bore can be determined by changes in the composition of the well effluent—well effluent being the total production from a well bore—as shown by its analysis from time to time. This is due to the fact that the gas-cap fluid has a higher percentage of the lighter constituents than the dark oil, and that the injected gas is generally composed of methane, ethane, propane, and only a small amount of the butanes. If, by comparison, the well effluent shows a decrease in certain fractions, a dilution effect caused by the entry of gas cap fluid, injected gas, or both, by migration to the well bore has occurred. The change can be computed and would give a physical indication of any migration and the magnitude of the change over the period between analyses. This method would not indicate, however, whether the change has been due entirely to an increase in gas-cap fluid, enriched injected gas, injected gas, or a combination of the three to give the same certain fraction content in the well effluent.

It becomes evident then, although there are a number of physical indications that migration of gas-cap fluid, enriched injected gas, or injected gas has occurred, that these indications in themselves do not permit an accurate determination of the respective amounts of migration to aid in detecting gas movements in the reservoir due to pressure-control operations by means of injecting gas.

Methods in use and proposed have been to add gases, called tracers, foreign to the hydrocarbons in known proportions to the injection gas. By determining the amount of tracer in the gas produced by surrounding wells, it is possible to calculate the amount of injected gas being produced. Periodic testing of the produced gas at frequent intervals by sensitive and quantitative means to determine the amount of the tracer would be needed to show how much injection gas is present in the gas produced.

One of the tracer methods is that used by The Carter Oil Co.* in an Illinois field in which carbon monoxide is added to the gas going to an injection well.

Other types of tracers used and suggested have been nitrogen, helium, carbon dioxide and related gases. Mercaptans also have been tried, but a possible diffusion effect was noted in one field experiment. The low concentration of any type of tracer in the produced gas, and especially with the inert gases, will require special laboratory apparatus and technique for qualitative and quantitative determination.

Limitations and Disadvantages of Tracers

The above-mentioned tracer methods, excluding mercaptans, have the advantage of telling the actual amount of traced injected gas being produced, but only when the entire amount of injection gas is treated with a tracer. In many cases pressure control may be in operation long before the actual need of detecting the migration of injected gas may be apparent, in which event the addition of a tracer to the injection gas is not immediately started. Consequently there may be large volumes of injected gas that have not been traced and which are now possibly being produced undetected.

Another disadvantage is that a producing field may have separate zones requiring various degrees of pressure control. Commingling of the gases for processing and compression then preclude the introduction of a tracer into one zone for the tracing of subsurface migration from it to another zone under pressure control.

Well-Effluent-Analysis Method

Consideration of some of the disadvantages and limitation of using tracers has led to the development of a new method for the detection of gas migration.

Presupposing that a producing reservoir having two sources of production, a gas-cap area and a dark oil ring, both of uniform but different composition, is being subjected to pressure-control operations to the extent of maintaining pres-

*The Oil and Gas Journal, Nov. 19, 1942, p. 36.

sures above the saturation pressure of the dark oil by the injection of a residue gas substantially free of butanes. It is further assumed that such a field will first produce dark oil, then a mixture of dark oil and gas-cap fluid, and then both of these two along with injected gas that will be enriched from the dark oil fluid as a whole. Relationships expressing certain properties can be developed from the composition and properties of the two sources and injected gas.

By use of production data and the fractional hydrocarbon analyses of the wet gas and trap fluid for wells producing exclusively from either the gas cap or dark oil ring, the weight fractional analyses are calculated for the two types of well effluents. The cubic feet at standard conditions of propane and lighter per 100 lb. of well effluent and the density of the isobutane and heavier in pounds per gallon are also calculated. By the method of mixtures, in which known proportions of the two well effluents are added together, the analysis and properties of a mixture of these two well effluents can be calculated. Conversely, if these basic data are known, the analysis and properties of a mixed well effluent can be used to determine the proportions of dark oil and gas-cap fluid in the well effluent. The various relationships can be expressed in equations of general type, and by substitution of analyses and properties of the source well effluents, the specific equations for mixtures from these sources can be developed.

For the purpose of numerical illustration, data of Dodson and Standing* have been used to develop the basic equation of an assumed producing reservoir. Their crude "B" has been taken to represent the well effluent from the dark oil ring and crude "C" the well effluent from the gas cap. In Table 1 are given the weight fractional analyses of these well effluents and the properties of the two portions propane and lighter, and isobutane and heavier.

TABLE 1—HYDROCARBON ANALYSES AND PROPERTIES OF DARK OIL AND GAS-CAP WELL EFFLUENTS

Component—	Weight fraction— Dark oil	Gas cap
Methane	0.1034	0.4791
Ethane	0.0230	0.0813
Propane	0.0249	0.0745
Butanes	0.0265	0.0547
Pentanes	0.0239	0.0437
Hexanes	0.0355	0.0426
Heptanes plus	0.7628	0.2241
Propane and lighter	0.1513	0.6349
Butanes and heavier	0.8487	0.3651
Cu. ft. propane and lighter per 100 lb. wells effluent	294	1.297
Density of butanes and heavier, lb. per gal. at 60° F.	7.044	5.951

*Prediction of Volumetric and Phase Behavior of Naturally Occurring Hydrocarbons, Dodson and Standing, Drilling and Production Practice, 326 (1941). A.P.I., New York (1942).

The above data have been used for establishing equations for this assumed field. The essential equations are shown graphically on Figs. 1 and 2.

Fig. 1 represents the relationship of the density of the isobutane and heavier with the amount of dark oil in the mixed well effluent for the above assumed field.

Fig. 2 shows how the isobutane and heavier content in a mixed well effluent varies with the amount of dark oil in the well effluent.

Usefulness of Equations

The equations represented by these figures are of use even if no pressure control operations by means of injected gas are being conducted in this field. In this event, it is possible by their use and the analysis of the well effluent to determine the proportions of dark oil and gas cap fluids being produced, and also the respective percentages of solution gas and gas-cap gas as long as the reservoir pressures are in excess of the saturation pressure.

In the event pressures are maintained by gas injection, the amount of injected gas being produced is of primary concern. Hence, it is well to develop what its effect is upon the well effluent and thus determine the quantity of it being produced. For the demonstration of this method, it has been taken that the residue gas to be used for injection purposes will contain only a small amount of the butanes, as the demand for these fractions by refineries has led to their high recovery by absorption plants. This being the case, the presence of injected gas will cause a dilution of the isobutane and heavier portion of well effluent. The basic equation covering the analyses of mixtures of dark oil and gas cap fluids is thus changed by the presence of injected gas. The density of isobutane and heavier portion is affected by the small amount of butanes in the injected gas, so this equation must be modified. The weight fraction of dark oil present in the mixed well effluent is approximated from the density of the isobutane and heavier relationship as shown in Fig. 1. This resulting value for the dark oil is then used in the equation expressing the amount of injected gas from the well effluent analysis to determine approximately how much injected gas is present. By use of this approximate value in the modified density equation, a better value for the amount of dark oil can be found. By repetitions of these approximations, constant values for the amount of injected gas and dark oil present in the dark oil-gas-cap portion of the well effluent-mixture can be found. Once these are known, the weight of dark oil, gas cap and injected gas, neglecting enrichment, in the well effluent can be computed. The equation expressing the amount of injected gas by analysis of the well effluent is represented in Fig. 3, where the above equation has been corrected for the butanes content of the residue gas used as injected gas for this assumed field.

For more practical purposes, it is desirable to know how much of the wet gas is being produced from each source, or its volume percentage distribution. From the composition of the well effluent, the volumes of propane and lighter from each source and nonenriched injected gas can be calculated and used to distribute the wet-gas production. In this case it is necessary to deduct the volume of injected gas from the wet-gas production and distribute the balance according to the propane and lighter from the dark oil and gas cap fluids. By this means it is possible, therefore, to determine

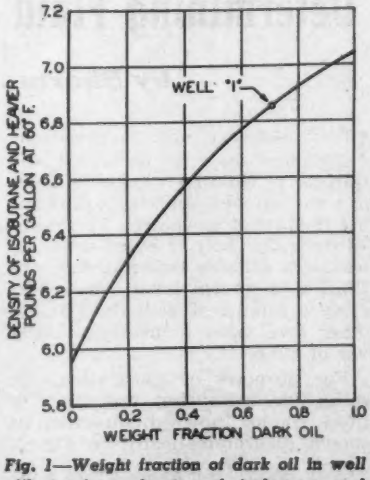

Fig. 1—Weight fraction of dark oil in well effluent from density of isobutane and heavier

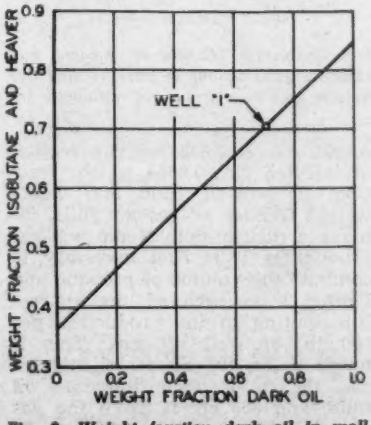

Fig. 2—Weight fraction dark oil in well effluent from weight fraction of isobutane and heavier

the cause of the increased gas-oil ratio for a producing well.

An illustration of the use of this method of determining the migration of gas cap fluid and injected gas will be given the use of the following data of an assumed well shown as well "1" on the figures. This well has been found by analysis of the wet gas and trap fluid and production data to have a well effluent containing 0.6684 weight fraction of isobutane and heavier with a density of 6.850 lb. per gallon, and also to contain 670 cu. ft. of propane and lighter per 100 lb. of well effluent. The well is producing with a gas-oil ratio of 3,220 cu. ft. per barrel and 441.0 lb. of well effluent per barrel of tank oil. From Fig. 1, the weight fraction of dark oil for a density of 6.850 lb. per gallon is expected to be 0.702. The expected weight fraction of isobutane and heavier from Fig. 2 for this value of dark oil is 0.704. Since this is greater than the 0.6684 found by analysis, injected gas is present. The weight fraction of injected gas for this well effluent is found to be 0.0525 and an equivalent dark-oil weight fraction of 0.7033 as shown by well "1" on Fig. 3. The well effluent is thus

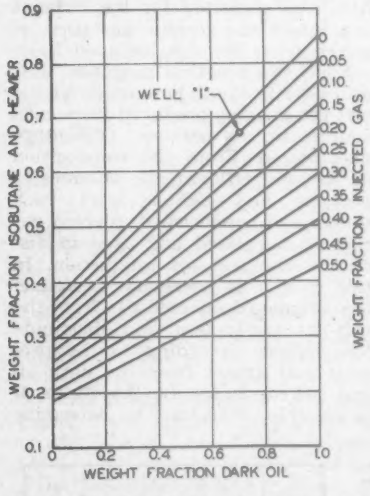

Fig. 3—Weight fraction of injected gas from weight fractions of dark oil and isobutane and heavier in well effluent

found to have 0.0525 weight fraction of injected gas, 0.6664 weight fraction of dark-oil fluid and 0.2811 weight fraction of gas-cap fluid. To make a distribution of the wet-gas production, it is first necessary to compute the volume of propane and lighter from each of the sources contributing to the production per 100 lb. of well effluent. This is found to be 106 cu. ft. of injected gas, 196 cu. ft. from the dark oil fluid, and 365 cu. ft. from the gas cap fluid, for a total of 667 cu. ft. The distribution of the wet gas produced per barrel of tank oil is found by subtracting the volume of injected gas in the total well effluent, 468 cu. ft. from the gas-oil ratio of 3,220 cu. ft., and distributing the resulting wet gas according to the propane and lighter from the two remaining sources. The distribution thus developed is as follows:

	Cu. ft.	Vol. %
Injected gas	468	14.5
Dark oil	962	29.9
Gas cap	1,790	55.6
	3,220	100.0

The results of this method applied to the well taken for an example shows that the entry of gas cap fluid is the primary cause of the increased gas-oil ratio. Injected gas is shown to be present and should possibly be controlled by remedial work.

The well-effluent-analysis method can be modified to apply also to a single-phase reservoir, being cycled, or a dark-oil reservoir being operated under pressure maintenance by injected gas. In this latter case, an enrichment of the injected gas due to contact with the residual oil in the reservoir may occur, which might lead to the belief that a gas cap was originally present in the reservoir.

Effect of Enrichment

One of the assumptions made in developing this method is that the enrichment of injected gas will be from the dark oil fluid as a whole. This is not strictly true as the enrichment can only occur from the components volatile at reservoir conditions. This enrichment of the injected gas by the residual dark oil is a continuous one throughout the contacted oil and can best be described as a process in which the vapors from one step of enrichment come into contact with another portion of fresh residual oil, and so forth, until the vapors can become no richer, or enter the well bore. Meanwhile fresh injected gas comes into contact with partially denuded residual oil and so on, until all of the components volatile at reservoir conditions have been vaporized. The enriched injected gas will approximate the composition of the vapors in equilibrium with the residual oil and should have approximately the composition and properties of the gas cap fluid. As the stripping progresses, the enrichment will become progressively less and finally no enrichment will occur.

Thus it is possible to have four types of fluid present in a well effluent—dark oil, gas cap, enriched injected gas, and injected gas. It is not possible to distinguish between gas-cap fluid and injected gas which has been completely enriched. The method does show the amount of injected gas that has not been enriched and should be of help in the guiding of pressure control operation and the planning of remedial work.

Periodic surveys by this well-effluent-analysis method in a producing field under pressure-control operation by injected gas will give information as to the migration of gas cap fluid and injected gas. Such a survey requires the fractional analyses of two samples per well, wet gas and trap fluid, the production data, and about 3 hours calculating time. The cost per well would be from $50 to $60 per survey and will give more information than the use of a tracer gas process. Even if a tracer is used, it is desirable to supplement the tracer method with the well effluent analysis method, as the tracer will only show the amount of any injected gas being produced and not how much of the increased gas-oil ratio may be due to gas cap expansion.

Determining Fluid Movement in Wells

by Sherman L. Pease*

IT is often desirable to determine whether there is occurring any transfer of fluid from point to point in a shut-in well, and, if so, to measure the rate of movement. The method described here is based upon releasing a suitable tracer in the well fluid at a known level, and recovering a sample of well fluid at another level after a measured interval of time.

For purposes of illustration, the setup for measuring migration of fluid in an upward direction is shown diagrammatically on Fig. 1.

*Shell Oil Co., Inc. Abstract from a paper presented before the A.I.M.E. at Los Angeles, October 20.

Lengths of the tailpiece and spacer are varied to place the crushing and sampling devices in the desired positions in relation to the sands being tested. The crushing device breaks the glass bottle containing the tracer when the tailpiece strikes the bottom of the well. The tracer quickly and completely disseminates in the well fluid. The sampling device is a suction bailer which obtains a sample of the fluid just before the unit is picked off bottom.

Normally on the first run into a well, the sample is obtained near the releasing point of the tracer, and thereafter samples are taken near the base of the upper sand if mi-

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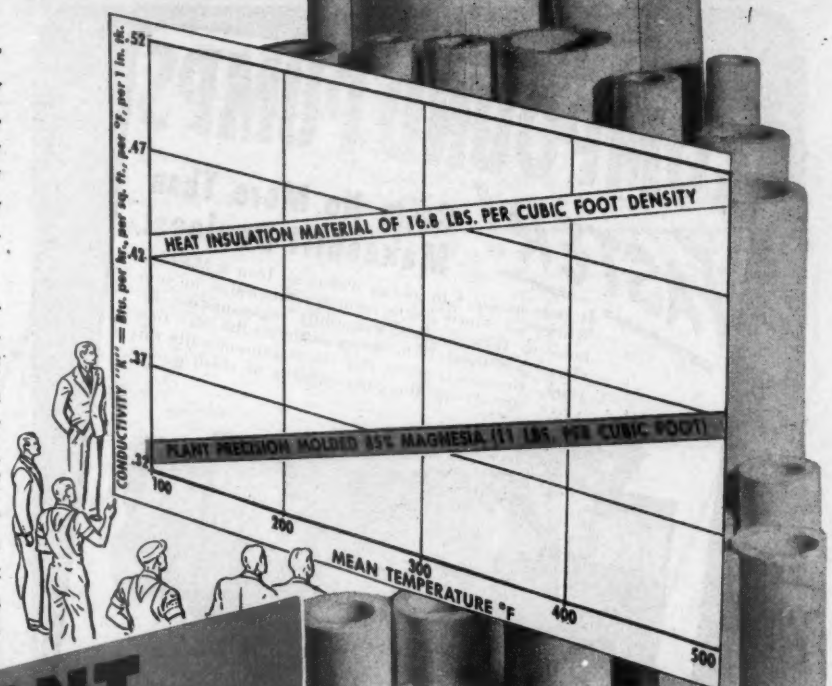

*Patents Nos. 2,131,374, 2,209,752, 2,209,753, 2,209,754

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gration is indicated by dilution or absence of tracer in the initial sample. Length of time interval between releasing of tracer and sampling of well fluid is varied for successive runs, attempting first to establish the rate within limits.

The rate of migration can be calculated from the relationship of the time interval to the volume represented in the interval between the releasing and sampling points. It is the writer's opinion, based on field results, that approximate rates of fluid movement in 6⅝-in. casing from less than 100 to over 1,000 bbl. per day can be determined.

For the tracing material, solutions of brilliant water-soluble aniline dyes have been found satisfactory in wells having an appreciable water cut. The use of a series of contrasting dyes for successive runs serves to identify each run and to eliminate confusion.

To reduce eddy currents as much as possible, the unit is lowered through the intervals to be tested at a very slow rate, and is held just off bottom several minutes to allow any currents to subside before the bottle is broken.

It will be appreciated that the general method has many possible variations with respect to equipment, technique and tracing materials, depending upon objectives and accuracy required. With minor changes, the equipment can be used for determining downward movement of fluid in a well bore. By utilizing suitable tracing materials the method might be used for determining rate of migration of oil into a gas cap or depleted zone.

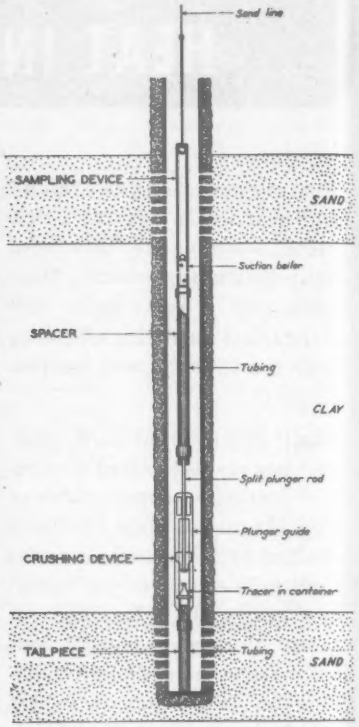

Fig. 1—Equipment for determining fluid movement

Acknowledgment

This method of determining fluid movement has been developed by the production department of Shell Oil Co., Inc., which has authorized this presentation.

Fred Van Covern, on leave from American Petroleum Institute, is chairman of the Petroleum Industry War Council's committee on petroleum economics, which has been holding a series of meetings in Los Angeles to examine economic conditions as they may affect the oil industry. Members of the committee are **Oliver S. Ambrose,** Tide Water Associated Oil Co., New York; **John W. Boatwright,** Standard Oil Co. of Indiana, Chicago; **David G. Gray,** statistical subcommittee District 3, Houston; **J. A. Lentz,** Continental Oil Co., Denver; **A. J. McIntosh,** Socony-Vacuum Oil Co., New York; **J. M. Sands,** Phillips Petroleum Co., Bartlesville, Okla., and **S. A. Swensrud,** Standard of Ohio, Cleveland.

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Not only has the American Iron & Machine Works Co. been doing its best to meet the needs of the oil industry, but we've also been up to our ears in war work.

Engineering Aspects Connected With Examining Undeveloped Areas and Leases

CERTAIN well-known generalizations regarding the occurrence of oil are helpful when selecting or examining undeveloped oil and gas leases. (1) The world over oil pools occur in geomonoclines, geosynclines, or geobasins which have continuous sheets of porous strata and adequate source beds from which oil originates. Examples are the San Joaquin Valley of California, the Maracaibo basin of Venezuela, the West Texas Permian basin, the East Texas Cretaceous geosynclines (Fig. 1), and others. (2) Oil pools do not occur haphazardly over the whole extent of these petroleum provinces. In most places, the oil is found in one or two or at most three of the most persistent and most uniformly permeable layers, and the oil pools in many places are aligned according to definite structural trends. Exceptions, of course, will be found locally where oil has migrated vertically through faults or joints into upper shallow sands or local lentils porous enough and sufficiently enclosed to hold the oil but not connected with a definite structure or a definite sand sheet. (3) Generally, the continuous, porous, water and oil-bearing sand sheets contain fresh water along their outcrop. Down dip toward the middle of the basin or toward the lower end of the monocline, the mineral content of the water, especially the per cent chlorides, sulfates, and total solids, progressively increases. At some rather

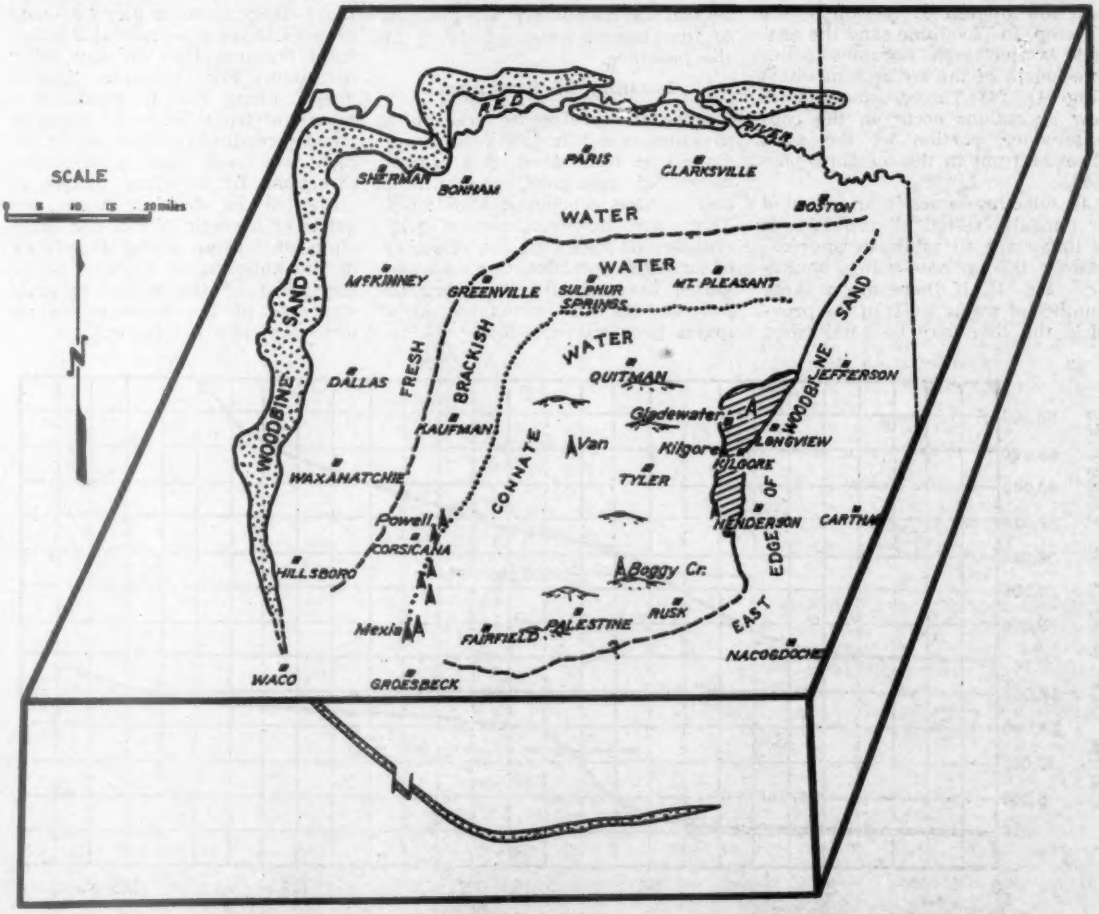

Fig. 1: Diagram of East Texas oil province showing extent of Woodbine sand and fresh-water, brackish-water, and connate-water (salt water) areas. The location of the principal oil fields are indicated by derricks. Note that the oil pools are all located in the salt-water areas

Series prepared by F. B. Plummer, professor, petroleum engineering school, University of Texas

indefinite position within the sand, known as the meteoric-connate water content, the mineral content of the water approaches that of the original sea water in which the sand was deposited. If one plots the mineral content of the water of a series of wells on coordinate paper against depth and distance from the outcrop (Fig. 2), it will be noticed that in many places the mineral content increases with depth rather uniformly, until the hypothetical connate water line is reached. Near the boundary the increase is more rapid. Within the connate water area the mineralization of the water may continue to increase with depth, especially if the water is in the geologically older sand sheets until, finally, the chloride content and total solids may be several times as concentrated as ordinary sea water. The connate portion of the sand sheet is small or large depending upon the permeability of the sand, the loss of water in the lower portion, and the amount of erosion of the outcrop. In Woodbine sand the connate water area occupies about one-fourth of the entire sand sheet (Fig. 1). (4) The oil pools with few exceptions occur in the connate-water portion of the sand sheet and not in the meteoric portion.

In selecting leases in an untested or partially tested oil province, it is important to establish approximately the connate-water boundary (Fig. 1). If there are a large number of water wells in the province, the line may be established by collecting and analyzing water samples from the sand sheet and plotting the total solids and chloride content on a map of the province. A line drawn through analyses points where chloride content is about 19,000 p.p.m. or where the total solids content is about 36,000 p.p.m. will establish approximately the connate-water boundary. If there are insufficient water wells to obtain these data, proceed as follows: Collect the analyses of a series of wells located along a line or lines parallel to the direction of dip of the beds. Plot the per cent chlorides or total solids on coordinate paper, placing the distances from the outcrop as abscissa, and the chloride content or total solids content on the ordinates (Fig. 2). Then the line connecting the chloride values may be projected and the distance from the outcrop to the 19,000 p.p.m. chloride line read.

A series of such curves and distances will furnish the data to establish approximately the position of the connate-water boundary in the province.

Locating Oil Structures

Once the preferable area in a province is outlined, the oil structures may be located by a combination of geological, geophysical, and perhaps geochemical methods. There are, however, certain generalizations regarding the selection of structures and location of wells which are helpful. These are as follows: (1) The structures in a given province are likely to be alike or quite similar, and there may not be present more than one or two types. Once the type of structure or the few different types of structure are known, the rest will most likely be similar. For example, in the East Texas province there are mainly two types, salt domes and normal faults. In the oil province of Sumatra in the Dutch East Indies and in some of the Rocky Mountain intermountain basins in this country, all the structures are compression folds, i.e., anticlines or elongate domes. (2) Anticlines formed by lateral compression and normal faults formed by tension are more likely to be lined up along the strike or along the strike of the regional major uplift rather than in any other direction. (3) In most places salt domes exhibit little alignment, but they are more likely to occur near the middle of a large basin than around the edges. (4) Structures due to buried ridges and oil pools due to stratigraphic traps are more likely to occur along a trend parallel to the ancient major structural features than in any other direction. For example, buried ridges along the foreland of a mountain front are more likely to trend according to the trend of the mountain range than in any other direction. In selecting blocks of leases or in deciding upon the shape of a single block, this principle of leasing along the trend of the anticline or fault or along the trend of the major regional structure of the province, is an important and helpful one.

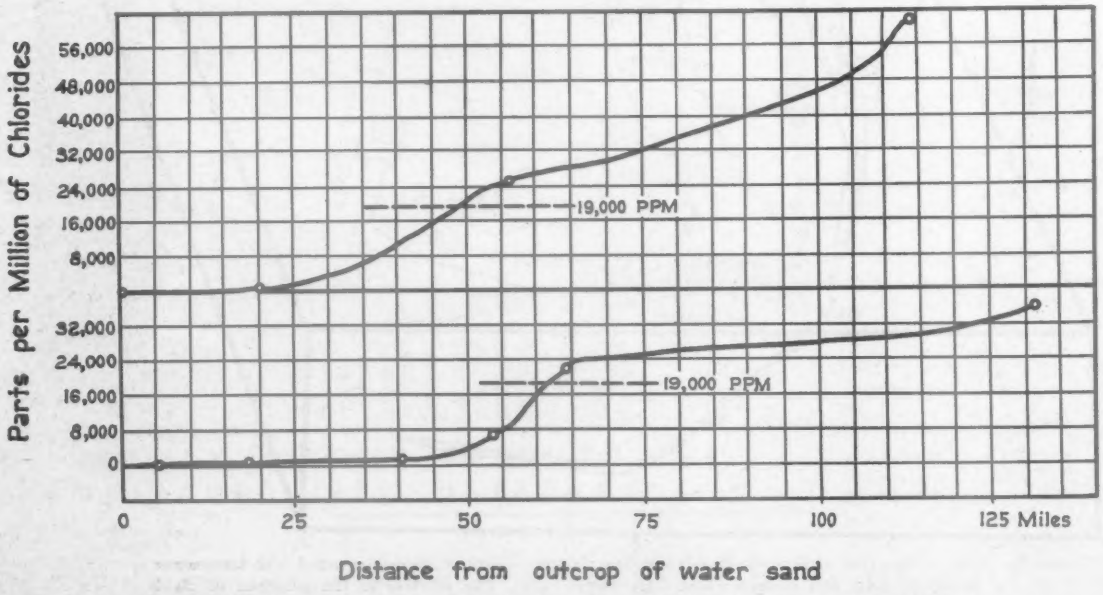

Fig. 2: Graph showing increase in salinity of water with depth and with distance from the outcrop. The points on the curve marked 19,000 indicate approximately the boundary between connate water (original sea water) and meteoric water which comes in for the most part from the outcrop

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Comparison of Crude Oils

THE scattered information on crude oils given in Nos. 9, 11, 13, 15 and 17 of the Refinery Notebook is summarized here by means of tables. Chemical analyses of petroleum are not adequate nor entirely reliable but the compositions of some bases of oils are shown in Fig. 1.

Characterization factor is a number which is always the same for each base of crude oil or the products from it. It is usually determined by dividing the specific gravity (taken at 60° F.) into the cube root of the absolute boiling-point (°F. plus 460) of the oil fraction being studied.

Viscosity index is a series of numbers from 0 to 100 which denote the rate of change of viscosity with temperature. Oils of zero index become very thick or viscous at low temperatures and become very thin at high temperatures. The reverse is true of oils of 100 index. The computation of viscosity index is explained in Petroleum Products and Lubricants (American Society for Testing Materials, Philadelphia).

AVERAGE PROPERTIES OF CRUDE OILS

Base of crude	Per cent of: Each	Sulfur	Gasoline
Paraffin	16.7	0.38	27.7
Intermediate	73.6	0.49	34.6
Naphthene	9.7	1.09	7.3
Total	100.0	0.55	30.6

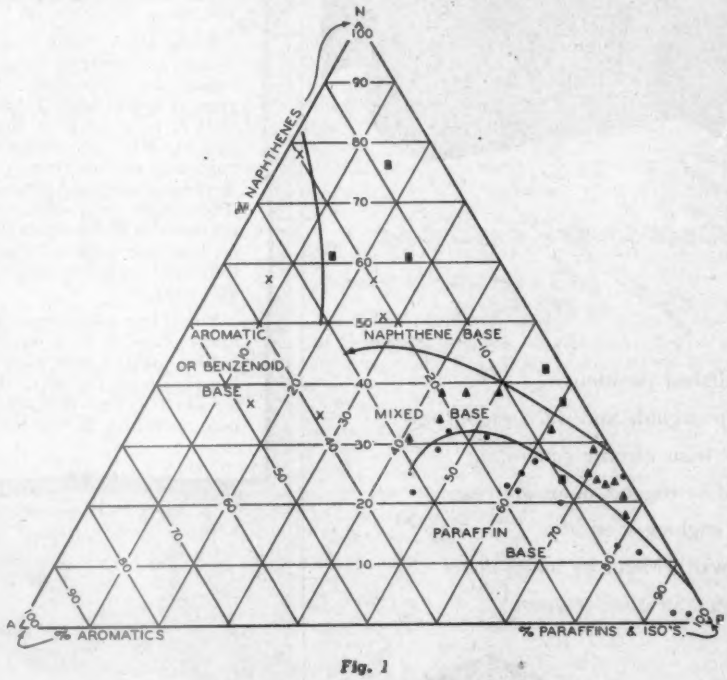

Fig. 1

Viscosity - gravity - constant is a number involving viscosity and gravity as follows:

$$vgc = \frac{10\,G - 1.0752 \log (V-38)}{10 - \log (V-38)}$$

in which G is specific gravity (60° F.) and V is viscosity at 100° F. It is mainly useful for lubricating oils.

Aniline point indicates the ability of a material to dissolve other materials such as paint, oils, and lacquers. It is the temperature (°F.) required to cause a half-and-half mixture of the solvent and aniline to dissolve in each other.

I.P.T. smoke point is the highest smokeless flame (in mm.) that a kerosene can make in the Institute of Petroleum Technology (British) test lamp.

Diesel index indicates the ignition quality of a diesel fuel oil. It is computed by dividing the product of A.P.I. gravity and aniline point by 100. An index below 40 is usually unsatisfactory and an index of 65 is excellent.

Base of crude or kind of stock—	Crude oil: Characterization factor	Crude oil: Viscosity gravity constant	Gasoline: A.P.I. gravity	Gasoline: A.S.T.M. Oct. No. (400 e.p. gaso.)	Solvent, Aniline point (°F.)	Kerosene: I.P.T. smoke pt., mm.	Kerosene: A.P.I. gravity	Diesel, Diesel index	Lube oils: Viscosity index	Lube oils: A.P.I. gravity
Paraffin	12.2-12.5	0.8 -0.82	62-72	34-53	120-175	30-40	44-50	51-76	90-106	23-32
Intermediate	11.8-12.0	0.82-0.85	54-64	50-61	105-165	18-30	40-45	49-65	65- 85	20-28
Naphthene	11.0-11.5	0.85-0.9	48-55	55-71	65-130	12-24	29-39	up to 40	0- 55	14-25
Cracked	10.0-11.8	.....	55-61	63-70	.....	.....	23-37	23-40	.....	.....
Coal tar*	9.5- 9.8	.....	23-30	90 & up	.....	.....	under 10	.....	.....	.....

*Approximate and for comparison only.

No. 20 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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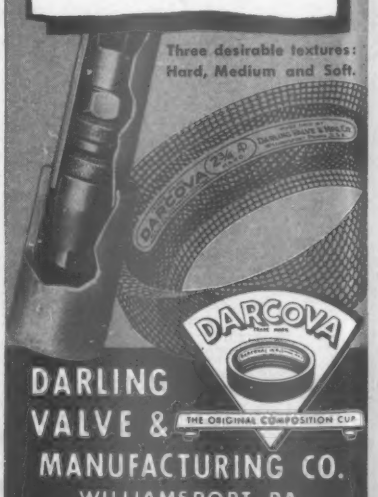

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Natural Gas

Consolidated Gas Acquires Additional Retail Outlets

OKLAHOMA CITY. — Consolidated Gas Utilities Corp., with headquarters in this city, has purchased from Oklahoma Natural Gas Co. equipment and franchises in Deer Creek, Pond Creek, Nardin, Hunter and Lamont in north central Oklahoma, the transfer to be made as of December 1, E. C. Joullian, president of Consolidated, announced last week.

These properties are on Consolidated's trunk pipe-line system, and Consolidated has been selling natural gas to Oklahoma Natural. They are an important addition to the retail outlets of the Consolidated, whose system extends from southwestern Oklahoma, through western Oklahoma and to Wichita, Kans., on the north. The major source of supply is in the east end of the Amarillo field and in the Sayre and Erick fields in Beckham County.

Barnwell Negotiating for Natural-Gas Service

BARNWELL, Alta.—Residents of Barnwell are opening negotiations with Canadian Western Natural Gas, Light, Heat & Power Co. of Calgary for a natural-gas service. The project will involve laying of a 2-mile transmission line and construction of a distributing system.

Memphis Natural Permitted To Export From Louisiana

WASHINGTON. — Federal Power Commission last week granted Memphis Natural Gas Co. the right to extend its pipe-line facilities from Louisiana, thus denying protests from that state that its gas should be used at home to attract industries.

Leon Fuque, FPC secretary, said that a certificate of necessity and public convenience had been accorded the company for two projects: Completion of doubling its transmission lines from Memphis to the Monroe (La.) gas fields, and extension of about 50 miles of line from Monroe to the Lisbon, La., gas fields.

The additional facilities would increase the daily capacity in the Memphis area by 21,000,000 cu. ft. and would supplement supply to cities in western Tennessee.

The applications stirred the interest of all gas-producing states last spring when the FPC refused the Memphis-to-Monroe petition. It held then that gas reserves in the Monroe field should be conserved for commercial, domestic and superior industrial uses.

It was declared that this decision, if allowed to stand, would give FPC unprecedented authority over use of gas.

When the rehearing began in Memphis the company was supported by the states of Texas, Tennessee, Arkansas, Mississippi and Kansas and Independent Natural Gas Association of America.

Louisiana, the National Coal Association and coal and railroad unions opposed the extensions.

Former Gov. Sam Jones of Louisiana, attorney for his state, said he would call a conference of the state's legal staff to discuss FPC's action. During the rehearing they had said an unfavorable decision would be appealed.

Incremental Carbon Black Exempt From Price Control

WASHINGTON.—Defense Supplies Corp. sales of incremental output of easy processing channel black will be exempt from price control, Office of Price Administration announces. Incremental (additional) production is being encouraged by an interagency program intended to bring out a supply needed to meet wartime rubber-production schedules.

Manufacturers will be given individual prices by OPA for the incremental output, the prices representing approximate total costs of production. These individual prices, varying from plant to plant, are expected to be higher than the established prices for normal output, as a result, generally, of the necessity of using higher-priced natural gas for the additional production.

All the incremental output will be bought by DSC and distributed by that agency at weighted average acquisition cost. Since DSC will pool the supply, and sell at an average flat price to industrial users, exempting the incremental sales by that agency from price control will have no effect on the general level of prices, OPA said.

Kansas Commission Fixes December Gas Allowable

WICHITA. — The conservation division of Kansas Corporation Commission last week set the daily allowed production of natural gas for December in the Hugoton field in Kearny, Finney, Grant, Haskell, Morton, Stevens and Seward counties at 6,823,902,000 cu. ft.

Kansas crude oil pipe-line runs decreased 2,002 bbl. to a daily average of 280,723 during the week ended November 20, the conservation division also reported.

First Repressuring System For Alberta in Operation

CALGARY, Alta.—Built by British-American Oil Co. at a cost of approximately $500,000, the first repressuring system in an Alberta oil field is now in operation in the south end of Turner Valley at the British-American absorption plant in 22-18-2w5. The installation includes two 600-hp. compressors and a high-pressure station of 1,600 hp. It is connected with 22 low-pressure wells by 7 miles of low-pressure gathering lines. The plant extracts 45-lb. vapor-pressure gasoline, which includes isobutane, for aviation use. Residual gas is then recompressed, either at 400-lb. pressure for delivery to the fuel market, or to 800 lb. for return to the formation through three input wells located in the high part of the structure.

Gas for use as fuel is delivered through 10 miles of 8-in. line to the Madison Gas Co. scrubbing plant, where sulfur is removed before distribution through the Canadian Western Natural Gas Co. system to Calgary, Lethbridge and intermediate towns in southern Alberta, or to the ammonia plant of Allied War Supplies in East Calgary, a government-sponsored enterprise.

The input wells for returning the residual gas to the formation are Sovereign Royalties 1, Carleton Royalties 1 and Pacalta 1, which will share in the income from gas production on the same basis as if they produced their normal quota of gas. Repressuring of the field with residual gas is expected ultimately to yield greater crude-oil and naphtha recovery, and do away with the previous practice of burning waste gas in flares.

Carbon-Black Plant to Be Built at Eunice by DPC

NEW YORK. — A carbon-black plant costing $1,250,000 is to be built at Eunice, N. M., by Defense Plant Corp. It will be operated by Panhandle Carbon Co., of New York.

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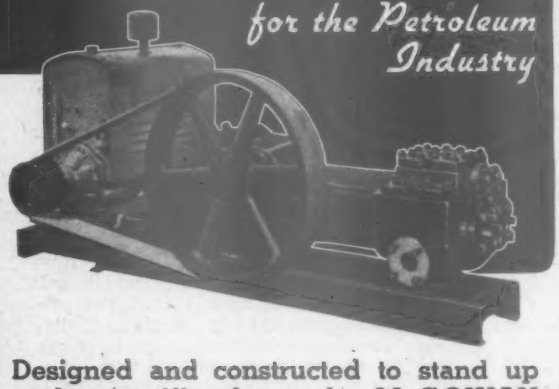

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REFINING

Deputations Lay Plans for Worldwide Cooperative

KANSAS CITY.—Plans for an international cooperative association, which would play an important role in the oil-refining business, are being laid by a deputation of senior directors of Cooperative Wholesale Society, of Manchester, England, and representatives of Consumers' Cooperative Association of Kansas City. The two groups went to Coffeyville, Kans., last week to inspect the cooperative refinery there. Following that visit they planned to go to Chicago.

The British deputation, composed of Aneurin Davies, Cardiff, Wales; James McFadyen, London, and Philip Robinson, Southport, England, plan to visit various cooperative associations in this country to determine what steps will be necessary toward furthering their worldwide project. They are accompanied by Wilfrid L. Wieland, manager of the New York office of the English society.

A desire to provide a sound organization to direct the international trade is their aim, the English representative said. Before the outset of war, they said, international trade had become a profitable undertaking. At present the society confines most of its efforts to distribution of wartime commodities, one of the most important of which is wheat received through the Union Equity Cooperative Exchange at Enid, Okla., Davies said.

McFadyen said the reason for the wartime gain of cooperatives in England is primarily that they have been able to pay a 10 per cent patronage dividend throughout the war, compensating members, he added, somewhat for the high prices they pay under present ceilings. Another reason for their success is the help they have given bombed-out areas through cooperative trading and sending of mobile units to feed affected areas.

Order Requiring Permits For Tank Cars Reinstated

WASHINGTON.— Reinstatement of the order requiring shippers to get government permits before using tank cars for movement of petroleum for distances less than 200 miles was announced last week by Office of Defense Transportation. The rule was relaxed 2 months ago by making the limitation 100 miles, but ODT said a new shortage of tank cars resulting from increased war demands made it necessary to reinstate the 200-mile limit.

New Mexico Asphalt to Get Increased Crude Supply

ARTESIA, N. M.—New Mexico Asphalt & Refining Co., through its subsidiary, Artesia Pipe Line Co., has extended its Eddy County, New Mexico, pipe-line system to the Loco Hills station of New Mexico Pipe Line Co. from the Turkey Track pool. Texas-New Mexico has contracted to deliver 2,500 bbl. of crude daily for 2 years from its Eddy County gathering system to the refinery of New Mexico Asphalt at Artesia to augment the plant's crude requirements. The extension consists of 4 miles of 4-in. line.

McCarthy to Build Gasoline Plant in Winnie Area

HOUSTON.—Glenn H. McCarthy, independent operator, last week announced plans for construction of a gasoline plant in the Winnie area of Chambers County, to cost $4,000,000. The plant is to have a daily capacity of 71,600 gal. of fluid daily. Crude

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Engineering specialists who are to operate Russia's new oil refineries are shown listening to M. J. Boho, combustion engineer, as he discusses control devices for refinery boilers. They arrived in Pittsburgh in November for a 6-day school conducted there by Hagan Corp. and at the company's Orrville (O.) factory. The visit was arranged by the foreign refinery division of Petroleum Administration for War and the War Department. Standing: P. Gudkov, V. Moroshkin, P. P. Gostev, V. Khudyakov and A. Solun (interpreter and an honorably discharged veteran of the Army). Seated: N. Pantaev, A. B. Bakutkin and A. Afonin. Gudkov fought against the Japanese in 1938 in the Far East, and Afonin, as major of artillery, took part in the battle for Moscow

will be drawn from the Stowell, Winnie and North Winnie pools and other producing fields in that area. Construction is slated to get under way early in December, McCarthy said.

The plant will manufacture automotive gasoline, aviation gasoline, butane, isobutane, isopentane and other products.

Fuel Oil Made Available to Users of Wood and Coal

WASHINGTON.—Advance rations of fuel oil may be obtained by householders while having heating equipment reconverted from wood or coal, Office of Price Administration has announced.

Butane-Using Installations Restricted by PAW

WASHINGTON. — Petroleum Administration for War announced last week that it no longer would authorize installation of equipment designed to burn liquefied petroleum gases. It was explained that butane and butane-propane mixtures are used extensively as industrial fuels and as domestic fuels in homes beyond the reach of gas mains.

The move to prevent further increases in consumption of these gases is designed to meet increased military requirements for 100-octane aviation gasoline. Butane is an important component in the manufacture of aviation gasoline.

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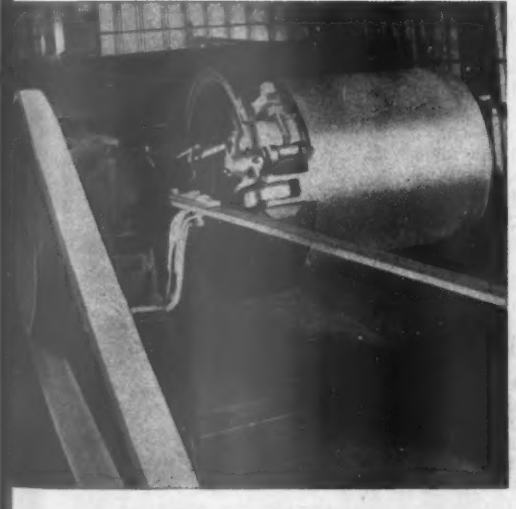

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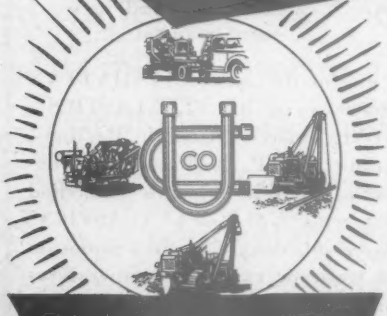

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PIPE LINES

Memphis Natural to Loop 61½ Miles of Trunk Line

Construction of 61½ miles of loops will be started December 15 for Memphis Natural Gas Co. The loops will consist of 18 and 20-in. pipe which will be laid to parallel unlooped portions of the trunk line from the Monroe, La., area to Memphis, Tenn.

The company's system now has 592 miles of pipe with diameters from 4 to 18 in. and four compressor stations.

In the new program, pipe for loops will be laid in Chico County, Arkansas, Bolivia, Coahoma and Tunica counties, Mississippi. Contract for construction has been awarded to N. A. Saigh Co.

Mexico to Build 270-Mile Line

Further to improve the distribution of petroleum throughout Central Mexico, construction of a 270-mile 14-in. pipe line will be begun in December, said Efrain Buenrostro, general manager of the petroleum administration.

The new line will extend from Poza Rica to Irapuato, passing through Tulancingo, Pachuca, Huichapan, San Juan Del Rio, Queretaro and Salamanca. It will transport 30,000 bbl. daily and will cost $11,000,000.

Gulf Proposes 63-Mile Line for West Texas

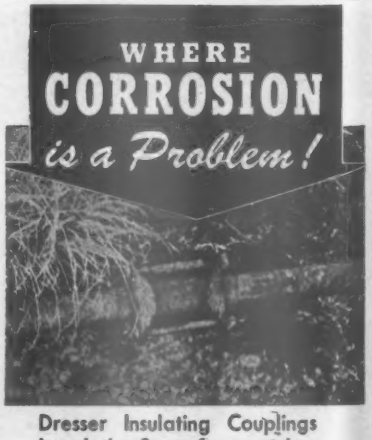
Another outlet for the fast-developing 10,000-ft. sweet-oil production in the Keystone pool of Winkler County, West Texas Permian Basin, has caused Gulf Refining Co. to begin surveying for a 63-mile, 8-in. pipe line from the pool via the Goldsmith pool of Ector County to its West Texas tank farm and terminal at Midland. Gulf pays $1.25 a barrel for the Keystone 40°-A.P.I. gravity production and handles it on a common carrier basis for Magnolia Petroleum Co. in order to segregate the sweet oil from Magnolia's sour crude purchases in the district.

In the Goldsmith pool, the new line would accept the sweet crude gathered by Standish Pipe Line Co., subsidiary of Phillips Petroleum Co., in the Embar pool of southern Andrews County, Texas.

The new line also would traverse the new three-pay area indicated by a wildcat being drilled by Cities Service Oil Co. and Shell Oil Co., Inc., on land owned by Texas Pacific Land Trust in western Ector County, Texas.

Louisville Gas Line Is Half Completed

Laying of a line to bring natural gas from the Tennessee Gas & Transmission Co. system to Louisville, Ky., has been more than half completed for Louisville Gas & Electric Co. The new line comprises 57 miles of 8-in. and 3 miles of 12-in. Williams Brothers Corp., the contractor, has been pushing the project in recent weeks with three spreads supervised by John Poston, James Lambert and George Allen



Dresser Insulating Couplings break the flow of current between pipe lengths, prevent hot spots and electrolytic corrosion on the gathering line shown in the above photo.

Complete stock of "Dressers" ready at Dresser Houston Warehouse. Contact your distributor

PHONE: CHARTER 4-4723; I.D. 2107

DRESSER
HOUSTON WAREHOUSE
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with the object of completing in the middle of December.

Pipe Line to Mexico Subject to Texas Approval

Chairman Beauford H. Jester announced that the Texas Railroad Commission has refused to waive hearing on a proposed pipe line to carry Hidalgo County, South Texas, natural gas to Monterrey, Mexico.

Application for the pipe line is pending before the Federal Power Commission, the Texas Railroad Commission was informed. It was requested that state investigation be waived.

Reynosa Pipe Line Co. proposes to build a 14-in. line from La Blanca, South Weslaco and North Weslaco gas fields in Hidalgo County, Texas, and to purchase 40,000,000 cu. ft. of gas daily from the La Gloria Corp., later increasing the amount to 60,000,000 cu. ft. if needed, Jester said.

The pipe line proposes to deliver the fuel to Gas Industrial de Mexico, S.A., for use in Monterrey industries. Two other lines, Jester said, now carry Texas gas to Mexico.

Reynosa had requested the Railroad Commission to waive its usual conferences and investigations and facilitate quick construction of this line.

Outlet to Be Provided For Aaron, Ky., Area

South Kentucky Pipe Line Co. is proceeding toward early construction of a crude-oil pipe line from its present terminus on Beaver Creek, Wayne County, to Aaron, Clinton County, Kentucky.

A pump station and tank farm will be established near Aaron, from which gathering lines will extend to surrounding pools. Gravity lines will move oil from wells to three gathering stations, from which it will go to the central station near Aaron. From there oil will be pumped through the main line to the Beaver Creek station, and thence to Somerset for transshipment by tank cars to refineries.

A permit for the pipe line has been issued by the Clinton Fiscal Court and agreements have been reached with oil producers in the Aaron area.

Plans Are Considered for Pressure Welding School

Resumption of the Pressure Welding School has been tentatively planned with the intention of starting the next session about January 15, 1945. A previous session of the school was conducted at Houston, September 14 to October 9 by Linde Air Products Co., when 78 superintendents, engineers, foremen, leading welders, etc., attended at the invitation of the company. All those receiving instruction were directly and technically interested in the application of the oxy-acetylene method to pressure welding.

Barge Shipments Aid Pipe Line and Rail Programs

Movement of petroleum and petroleum products in barges on the rivers, canals and other inland waterways of the United States will average 1,475,030 bbl. a day, in 1944, the Office of Defense Transportation announced. This figure, which does not include traffic on Pacific Coast streams, represents in increase of 18.1 per cent over the 1943 daily barge movement of 1,207,542 bbl.

Lawrence C. Turner, head of ODT's waterways transport department, said that the major portion of this movement was within the Atlantic Coast states or represented shipments from centers of crude production or refining to the Atlantic seaboard. Among the principal water routes for petroleum in barges are: From Texas ports along the Gulf Intracoastal Canal; over the Great Lakes and New York State Barge Canal; up the Mississippi and Ohio Rivers, and via the Atlantic Intercoastal Canal from Florida northwest.

"An important function of this barge traffic is that it serves as a pickup and supply medium between widely separated railroad terminals, as well as between pipe-line terminals," said Turner. "Without such supporting movement by the barges, the rails and pipe lines would not be able to keep an adequate wartime supply of petroleum and its products moving continually to the places where they are vitally needed."

Cut & Bevel Any Pipe
With
Maximum SPEED
Minimum COST

The H & M PIPE CUTTING and BEVELING MACHINE

SPEED: Complete cut and bevel can be made on 12 inch pipe in about 2 minutes.
ECONOMY: Save approximately one-half labor and gas costs.
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1608 MERCANTILE BANK BLDG.
DALLAS, TEXAS
Central Warehouse: Valley Park, Missouri

PIPE LINE CONTRACTOR
Capable of handling the toughest of pipe line jobs, with a THOROUGHNESS that gives you new economy in pipe line service, the I. C. Little Organization is prepared to do a top-notch job of pipelining for YOU.

Reduced reproduction of Fred E. Cooper advertisement

and 9 YEARS LATER
1944
the W WINCH TRACTOR—
is more popular than ever having proved the soundness of
neering design, by its outstanding performance.
No Allis-Chalmers Model W Winch Tractor has become obsolete, worn-out or gone permanently out of commission because of mechanical failure. Because their original design was RIGHT there has been no need of major design changes. Being a standard production model, interchangeable parts, repairs can always be made using factory built parts.
Today's Model W pullin
streamlined, but it's still
pact, sturdy winch tractor po
Allis-Chalmers heavy duty 4 c
cu. inch engine. Road speed
maximum. 4 road speeds forward,
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r.p.m. of engine. 8 line speeds on drum.
Maximum line pull 20,666 lbs. Winch drum
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A-C Model W SKID WINCH
A small type skid winch, one that can quickly be mounted on a small truck. Equipped with same engine, transmission and winch mechanism that is in the Model W Tractor. It will handle 3,500' of 2" Iree tubing. Maximum line pull of Unit 20,666 lbs.
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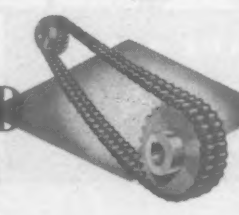
One of the first models—the Rumely-Fred E. Cooper OilPull Winch Tractor of 1920—and in the reproduced advertisement, a later type Allis-Chalmers-Fred E. Cooper Winch Tractor. Both equipped with Diamond Roller Chain Drives.

As the Fred E. Cooper advertisement says—"Outstanding performance has proved the soundness of original engineering design"—and further,—"No Model W Winch Tractor has become obsolete, worn-out or gone permanently out of commission because of mechanical failure."

From the time of the original design—25 years ago, streamlining and improvements have been made, but the basic idea remains.

And during all these years—DIAMOND Roller Chain Drives have helped with their stamina, durability and efficiency to insure the operating performance for which these Winches have become noted. DIAMOND CHAIN & MFG. CO., 475 Kentucky Avenue, Indianapolis 7, Indiana. Tulsa Office: 2238 Terwilleger Blvd.



DIAMOND ROLLER CHAINS

Exploration and Drilling

Week's Highlights

CALIFORNIA'S problem of supplying the oil requirements of the Pacific war has been the subject of so much discussion that gas developments in that state have been somewhat overlooked.

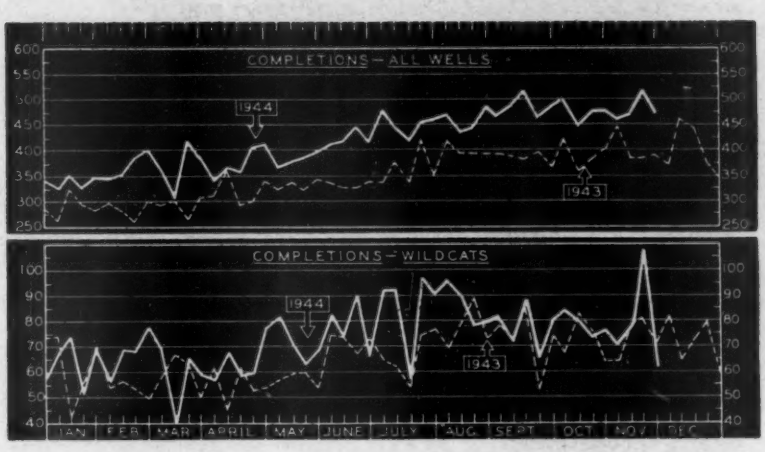
Although wildcat oil discoveries have not been particularly impressive this year, the opposite is true of gas discoveries. So far there have been six important gas discoveries, four of which look like possible major fields, and in addition, a deeper pay has been opened up in the Rio Vista gas field.

The deep strike in the Rio Vista field was made by Standard Oil Co. of California H-6 Perry Anderson in 36-4n-2e, with an initial flow of 16,700,000 cu. ft. from the Eocene at 5,735-5,830 ft. The Honker field, at the east end of Suisun Bay in Solano County, was opened by Standard's discovery well in 25-3n-1w, producing 3,200,000 cu. ft. from Eocene sand at 7,190-7,429 ft.; while the Suisun field, 6 miles northwest of the Honker discovery, was also discovered by Standard, the discovery well in 5-3n-1w, flowing 7,350,000 cu. ft., from zones at 3,410-90 ft., and 3,500-3,640 ft., with a deeper zone at 3,875-3,949 ft., which was not opened on final completion, but which on test, flowed 8,000,000 cu. ft. daily.

Some 12 miles north of the Rio Vista field, Amerada Petroleum Corp. 1 Starkey, in 2-6n-2e, flowed 22,500,000 cu. ft. from the Eocene at 4,550-4,600 ft., to open the Dixon field. Richfield Oil Corp. 1 Chico produced 3,200,000 cu. ft. from Cretaceous sands at 4,365-90 ft., to open the Chico field, the farthest north gas field in the state, just 5 miles southwest of Chico in Butte County.

Despite these discoveries, announcement has been made of plans by the Pacific Gas & Electric Co. and Pacific Lighting Corp., to build 1,000 miles of 27½-in. gas pipe line from the Texas Panhandle-Hugoton gas fields to southern California at an estimated cost of $60,000,000; with construction to be completed before the winter season of 1945-46.

This would indicate that the new gas discoveries are considered to provide no more than a reasonable reserve for the future northern California gas market, necessitating outside sources to meet the anticipated requirements of southern California.



Solid line charts current weekly completions, service wells in Eastern area not included

COMPLETIONS IN ALL FIELDS . . .

Week ended November 25, 1944

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1944	1943
N. Y., Penna., W. Va.	64	20	*56	*140	190,110	†5,662	3,131
Ohio	6	15	5	26	64,868	919	854
Indiana	0	0	3	3	5,673	232	200
Kentucky	3	4	5	12	23,666	574	412
Illinois	37	1	17	55	149,245	1,756	1,605
Michigan	6	1	5	12	29,922	616	575
Kansas	10	9	18	37	120,123	1,673	1,536
Nebraska, Missouri, Iowa	0	0	0	0	0	35	44
Oklahoma	23	4	19	46	175,783	1,666	1,084
Texas:							
North Central	20	1	15	36	105,759	1,336	1,353
West	25	1	4	30	129,621	1,437	836
Panhandle	8	2	0	10	30,751	264	166
Eastern	1	1	2	4	23,016	290	279
Gulf Coast	19	1	4	24	153,883	1,143	434
Southwest	11	1	4	16	71,755	618	838
Total Texas	84	7	29	120	514,785	5,088	3,906
Louisiana:							
Northern	2	3	5	10	32,625	296	300
Southern	4	2	4	10	87,625	437	331
Total Louisiana	6	5	9	20	120,250	733	631
Arkansas	2	0	0	2	11,476	197	246
Mississippi	1	0	1	2	12,708	136	94
Southeastern States	0	0	2	2	12,110	46	‡
Montana	2	0	1	3	8,354	319	214
Wyoming	3	0	2	5	22,139	158	120
Colorado-Utah	0	0	0	0	0	31	23
New Mexico	5	0	0	5	16,566	360	208
California	26	1	9	36	160,088	1,807	1,236
Total United States	279	67	181	526	1,637,866	22,108	16,119
Total previous week	302	41	232	575			
Total Nov. 27, 1943	218	38	132	388			

*Includes 58 pressure wells. †Includes service wells in Appalachian area. ‡Included in total shown for Mississippi.

SOUTHWEST TEXAS

Tide Water Completes San Patricio Test

CORPUS CHRISTI.—Tide Water Associated Oil Co. 1 P. E. Dyer, in West Sinton field, San Patricio County, was completed flowing 22 bbl. of oil plus 40 per cent b.s. and w. daily through ⅛-in. choke, tubing pressure 220 lb., casing pressure 315 lb., from perforations at 1,046-52 ft. This well was drilled to total depth of 3,480 ft. and plugged back to test the shallow sands. Pump is being rigged up on this well.

Transwestern Oil Co. et al 3 Goebel Unit, Goebel field, in Live Oak County, is cleaning gas and distillate through 3/32-in. choke, tubing pressure 2,375 lb., casing pressure 2,500 lb., from 94 perforations at 7,010-25 ft. The company's well, 4 Goebel, same field and survey, is coring below 6,900 ft.

The Texas Co. 1 Mrs. J. K. Cochran, wildcat, 5 miles east of Oakville, and 1 mile east of Coquat field, is drilling below 6,365 ft.

La Gloria Corp. 1 South-Weslaco Unit, wildcat 1 mile southwest of Weslaco, in Hidalgo County, is drilling ahead after testing salt water on perforations at 8,240-55 ft.

SOUTHWEST TEXAS WILDCAT COMPLETIONS

Brooks County: Standard Oil Co. of Texas 4 Braulia G. De Garcia, 1½ mi. southeast of Alta Mesa field, in La Encantada grant, TD 8,106 ft., perf. 7,387-7,400 ft. and 7,410-20 ft. Potential test, 11,600,000 cu. ft. gas and estimated 250 bbl. distillate daily on open flow. Tubing pressure shut in 4,880 lb.

Duval County: Cullen-Porter 1 Jesus V. Ruiz, AB&M Sur. 136, 12 mi. west of San Diego, dry at 4,225 ft.

Karnes County: H. R. Smith and W. C. McBride, Inc. 1 W. C. McCaskill, Jr., Victor Blanco Sur., 8 mi. south of Runge, TD 8,650 ft., perf. 7,404-09 ft. Potential test, 108 bbl. day ¼-in. choke, estimated 18,000,000 cu. ft. gas open flow, gas-oil ratio 22,500 to 1, tubing pressure 2,375 lb., shut-in pressure 2,660 lb., gravity 50.8°, no water.

Refugio County: Sinclair Prairie Oil Co. 1 Robert L. Shaw, John Rainey Sur., 2 mi. southeast of Maudlowe, dry at 8,215 ft.

Zapata County: Ralph E. Fair 1 Santiago and Francisco Cuellar, Share 4, Blk. 14, Porcion 36, dry at 3,006 ft.

MICHIGAN

Arenac County Gets Three Gushers

SAGINAW.—Three Arenac County gushers marked an otherwise quiet week in Michigan oil and gas fields as operators reported 12 completions, 6 for oil, 1 for gas and 5 dry holes, of which 4 were wildcat tests.

C. W. Teater-Rowmor Corp. 1 State-Adams in Section 14 of Adams Township rated a potential of 3,360 bbl. a day natural, while Ervin Major's 3 Flack, Section 9, of Deep River Township, acidized for the same potential, and Major 1 Lesny, Section 9 of Deep River, flowed 118 bbl. natural on 3-hour test. Sohio Petroleum Co. added another good well when its 6 Cummings in the Isabella-Coldwater pool came in for 430 bbl. natural, pinched, in the first 12 hours. Smaller producers were completed in Allegan and Bay counties.

Michigan Oil & Gas Association reported Michigan production for October totals 1,499,160 bbl. on a daily average of 48,360 bbl. from 3,374 wells. Volume was up slightly higher, the September average being 48,243 bbl.

Sections 8 and 9 of Arenac's Reep River Township is in line for considerable extra development, 3 of the 15 permits issued by the state conservation department going to Basin Oil Co.-Don Rayburn for tests there. Sohio and Cities Service Oil Co. each took out another permit for wells in the Coldwater pool. Other locations are in Monroe, Bay, Mecosta, Muskegon, Montcalm, Missaukee, Allegan and Ionia, one each, and Van Buren two.

MICHIGAN WILDCAT COMPLETIONS

Kent County, Algoma Township: S. L. McClure 1 Frank Rector, NE SE SE 24-9n-11w, dry in Traverse limestone, TD 2,296 ft.

Ottawa County, Holland Township: Rex Oil & Gas Co. 1 William Huizenga, SW SE NW 24-5n-15w, dry in Traverse limestone, TD 1,546 ft.

Sanilac County, Sanilac Township: J. W. Spencer 1 Swazy, SW SE SW 22-12n-16e, dry, TD 448 ft.

Wexford County, Haring Township: Freeman Oil Co. 1 Gertrude Andrews, N½ NE SE 1-22n-9w, dry in Dundee, TD 3,916 ft.

TEXAS GULF COAST

Wharton County Wildcat Is Still Testing

HOUSTON.—General Crude Oil Co. is still testing at the 2 Security Bank & Trust Co., wildcat in S. Castleman Survey, 4 miles southwest of Lane City, in Wharton County. Last test showed a flow of 10 bbl. an hour on ⅛-in. choke, with working pressure 1,100 lb. at beginning of the test, but pressure declined and the flow dropped to approximately 5 bbl. an hour at end of test. Gravity of the oil is 26.1°. Total depth of this hole is 5,727 ft. with 5½-in. casing set at 5,550 ft.

Tide Water Associated Oil Co. 1 Underwood, prospective discovery well about 3 miles northwest of Sheridan in Colorado County, is waiting on cement now after cementing a split found in the casing around 6,400 ft. Producing from perforations at 9,517-21 ft. in the Wilcox sand, the well flowed 29°-gravity oil. Several tests have been run in this wildcat and it is expected to open a new field. It showed gas-condensate production in perforations at 9,500-02 ft., and showed oil and some salt water at 9,530-32 ft.

A show of gas with a spray of oil was encountered by Atlantic Refining Co. 3-C Denman-Kountze, wildcat in West Markham area, Matagorda County, in perforations at 4,865-78 ft. Total depth is 5,311 ft. with 5½-in. set for completion attempt.

G. W. Strake 1-W P. G. Krohn "B," Wilcox test at Conroe, Montgomery County, is drilling ahead below 10,400 ft. and is expected to reach another coring point soon. A sand section cored recently showed a definite gas kick and mud had to be added to control the gas, but no further trouble has been encountered.

Sun Oil Co. added another producer in the Fig Ridge field, Chambers County, with 6-A S. W. Pipkin, completed from perforations at 8,545-60 ft., flowing 277 bbl. daily through 12/64-in. choke with tubing pressure 750 lb., and casing pressure 700 lb.

North of the Fig Ridge field production, Gulf Oil Corp. 1 Bernhardt squeezed off the perforations at 8,950-58 ft. and is preparing to make a test after perforating at 8,878-86 ft. Total depth of the hole is 9,085 ft. in shale.

Skelly Oil Co. 1 Granbury-Fullilove, which opened a new gas and condensate field 3 miles northeast of Van Vleck, in Matagorda County, is shut in now with final gage yet to come. Before being closed in it reported a test which produced 42 bbl. of distillate and 2,137,000 cu. ft. of gas daily through ¼-in. choke from perforations at 8,739-47 ft.

Humble Oil & Refining Co. 1 Nona Mills Co., deep test approximately 1½ miles northeast of Rockland in Jasper County, cleaned up fish job at 10,087 ft.

DAILY AVERAGE PRODUCTION FOR WEEK

	Nov. 25 crude oil	Distillate, allied products	December PAW quota all oils	Nov. 18 crude oil
Arkansas	80,300	5,100	83,100	80,450
California	875,750	52,000	937,000	887,250
Colorado	9,500		9,500	9,500
Eastern	66,800	8,800	78,200	67,900
Illinois	211,400	12,300	212,300	189,400
Indiana	13,200		13,000	12,600
Kansas	274,200	6,000	280,000	282,700
Kentucky	29,400	2,800	32,800	30,400
Louisiana	363,650	35,300	385,300	363,550
North Louisiana	72,350			72,250
South Louisiana	291,300			291,300
Michigan	47,800	500	47,500	49,800
Mississippi	52,950		53,000	52,550
Montana	25,550	400	23,400	23,600
Nebraska	950		1,200	1,000
New Mexico	104,650	5,600	111,600	104,650
Oklahoma	357,250	27,000	337,000	358,050
Texas	2,132,300	145,000	2,278,000	2,132,300
East Texas	367,850			367,900
East Central Texas	144,600			144,600
North Central Texas	151,250			151,200
Texas Panhandle	94,150			94,150
West Texas	473,900			473,950
South Central (S. A.)	20,150			20,150
South Texas (Laredo)	79,350			79,300
Lower Gulf Coast	247,650			247,650
Upper Gulf Coast	553,400			553,400
Wyoming	88,350	3,500	103,500	90,600
Total United States	4,734,000	304,300	5,026,400	4,736,300
Change from previous week	down 2,300			

Total production January 1-November 25, 1944 ..... 1,503,265,900 bbl.
Same period last year ..... 1,344,534,700 bbl.

MORE pipe racking space because this new IDECO GIANT traveling BLOCK is the narrowest 350 TON BLOCK You can Buy.

ONLY 28 3/4" WIDE

Streamlined construction assures free movement past the drill pipe.

"Over-balanced" design permits greater lowering speeds.

Large (48 inch) alloy steel sheaves give you longest wire rope life.

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IDECO

ONE OF THE DRESSER INDUSTRIES

and is drilling ahead below 10,101 ft. in shale and lime.

Sun Oil Co. 1 Merchants Estate, wildcat in Sour Lake area, Hardin County, is testing in perforations at 6,335-65 ft. On production test it flowed 75.6 bbl. in 9 hours through ¼-in. choke, gravity 29.6°, tubing pressure 225 lb. It is still testing.

Through error last week a report was made that Amerada Petroleum Co. had plugged its 1 Daboval, discovery well in the Daboval area of Wharton County. The dry hole was the 1 Reitz, northeast offset to the producer. The 1 Daboval is still on production.

UPPER GULF COAST WILDCAT COMPLETIONS

Harris County: Magnolia Petroleum Co. 1 Warren Ranch, Joshua Hudson Sur., 5 mi. south of Hockley, dry at 7,754 ft.

Wharton County: Salt Dome Oil Corp. et al 1 H. P. Stockton, J. Findley Sur., 5 mi. northwest of Louise, dry at 5,712 ft.

SOUTH LOUISIANA

Humble's Laurel Ridge Extension Test Completed

NEW ORLEANS.—Humble Oil & Refining 1 Robinson, extension to the Laurel Ridge field in Iberville Parish, is completed flowing at the rate of 32.4 bbl. condensate daily with 1,350,000 cu. ft. gas through 7/32-in. choke. Production is through perforations made just above the plugged-back depth of 10,635 ft. and it showed a tubing pressure of 3,700 lb. Gravity is 49.3°.

Sun Oil Co. 1 Mrs. Button et al, southwest extension to Egan field, Acadia Parish, is now pulling tubing after testing perforations at 10,828-33 ft., where it flowed gas condensate with a little water.

Union Oil Co. of California 1-B State White Lake, an extension to West White Lake field in Vermilion Parish, set 5½-in. production casing at 11,894 ft. after drilling to total depth of 11,996 ft. The field now has two wells, one of which produces from 8,356-75 ft., and from 10,660-675 ft. The other producer is completed in one sand through perforations at 10,684-688 ft. and is maving 37-gravity oil instead of distillate as produced in the first well mentioned.

Humble Oil & Refining Co. 1 I. R. Price, at Delta Farms field in La Fourche Parish, flowed 350 bbl. day for completion through 5/32-in. choke, gas-oil ratio 294 to 1, perforations 9,413-24 ft. Total depth was 9,490 ft., with 7-in. set at 9,478 ft. Tubing pressure was 1,600 lb., gravity 36.5°, 0.1 per cent water.

Humble completed 1 Louis Laiche et al at Hester field in St. James Parish, flowing at rate of 6,400,000 cu. ft. gas daily with 144 bbl. condensate daily on ¼-in. choke, gravity 43.8°. Production is from perforations at 11,073-93 ft. with 2½-in. set at 10,070 ft.

The battery of Columbian Bolted Steel Tanks shown above are serving the Stanolind Oil & Gas Company in a Texas field.

● It's the year after year of dependable trouble-free service Columbian Bolted Steel Tanks give in the oil fields of the world that have proved their value to the oil producing industry.

Columbian COP-NIC Bolted Steel Tanks, especially for sour crude, will be available again as conditions permit. Regular bolted steel tanks available to oil producers now.

COLUMBIAN STEEL TANK CO.
KANSAS CITY, MISSOURI

ILLINOIS

White and Hamilton County Wildcats Showing Oil

CENTRALIA.—Fifty-five wells were reported completed in Illinois in the past week, 37 of which were oil wells with an average production of 90 bbl. per well the first 24 hours. Fifty new operations were reported, 19 of these being wildcats in 14 counties.

Two outpost wells were giving promising signs of production. Deep Rock Oil Corp. 1 Kirk, trustee, SW SE SW 17-7s-4e, Franklin County, was swabbing oil at the rate of 5 bbl. per hour from Aux Vases sand at 3,113-32 ft. It is 2 miles from other oil wells. Sinclair Wyoming Oil Co. 1 Russell, SW SE SW 17-7s-5e, Hamilton County, was swabbing at the rate of 20 bbl. of oil per hour from Aux Vases sand at 3,131-45 ft. It is 3 miles from other production.

Fifty new operations were reported during the week, including the following 19 wildcat starts: A. M. Scroggins 1, no farm name, NW SW NW 19-5n-3w, 4th p.m., McDonough County; New Penn 1 Hallam, SW NE NE 8-3s-9e, Wayne County; Kingwood 1 G. L. Land, SW SW NE 23-4s-7e, Hamilton County; W. I. Lewis 1 Burkhardt, SE NE SW 18-5s-9e, White County; W. C. McBride, Inc. 1 Atkins, SE SE SW 11-3n-14w, and Pure Oil and Ohio Oil 1 Koertge Community, NE NE NW 33-3n-10e, Richland County; J. J. Lynn 2 Horton, SE SW SW 7-3s-11e, Wabash County; Great Lakes 1 Zimmerman, SE SE SW 9-7s-10e, White County; Great Lakes 1 Stewart, SW SW SE 18-7s-10e, and Sinclair Wyoming 1 Ed Hines, SE SE NW 3-9s-10e, Gallatin County; Joe Bander et al 1 Gibson, NW NW SE 36-6n-5e, Effingham County; Paul Doran 1 L. E. Fox, SE SW SE 20-6n-2e, Fayette County; Sinclair Wyoming 1 K. Leach, SW SW NW 36-2n-5e, Wayne County; Leonard Oil Co. 1 Crowley, 550 ft. from north and 440 ft. from west lines NW¼ 1-7s-3e, Wayne County; C. E. Brehm 1 C. F. Webb, SE SW SE 28-8s-6e, Saline County; B. J. Holfelder 1 Galbraith, C S½ NE SE 14-7n-2w, Montgomery County; Magnolia Petroleum 1 R. Plocker, NE SW NW 10-3n-5w, Madison County; B. F. Thompson 1 Elmore, SE NE NW 11-6n-2w, Bond County; T. M. Conry 1 Vogel, SW SE SW 33-2n-2w, Clinton County.

ILLINOIS WILDCAT COMPLETIONS

Bond County: Magnolia 1 Prater, NW NW NW 31-7n-2w, dry at 1,496 ft. Base of Pennsylvanian 812 ft., Barlow 900 ft., Cypress 950 ft., Aux Vases 1,138 ft., Ste. Genevieve 1,166 ft., St. Louis 1,255 ft.

H. Luttrell 1 J. H. Ulmet, SE NW SW 8-4n-3w, dry at 1,107 ft., Golconda 784 ft., Barlow 884 ft., Paint Creek 1,002 ft., Benoist 1,063 ft., Renault 1,101 ft.

Effingham County: Homer Luttrell 1 Slausis, NW NW NE 25-6n-5e, dry at 2,532 ft. Glen Dean 2,028 ft., Paint Creek 2,300 ft., Benoist 2,332 ft., Aux Vases 2,398 ft., McClosky 2,482 ft.

Jefferson County: Harry Sherman 1 Jefferson O & G, SE SW NE 30-3s-2e, dry at 2,605 ft. Upper Menard 1,797 ft., Glen Dean 2,026 ft., Benoist 2,426 ft., Aux Vases 2,502 ft., Rosiclare 2,569 ft.

Lawrence County: Hayes & Wolf 1 Cunningham, SW SW SW 32-2n-13w, dry at 2,845 ft., Vienna 2,110 ft., Glen Dean 2,247 ft., no Cypress sand, Paint Creek 2,432 ft., Benoist 2,587 ft., Fredonia 2,760 ft.

Marion County: Ohio Oil 1 Spangler, SE SE NW 1-1n-3e, dry at 2,786 ft., Menard 1,890 ft., Glen Dean 2,092 ft., Cypress 2,300 ft., Weiler 2,330 ft., Benoist 2,456 ft. and 2,472 ft., Fredonia 2,662 ft.

Wayne County: Pure 1 F. M. White, SW NW SE 6-1n-9e, dry at 3,237 ft., Tar Springs 2,456 ft., Cypress 2,782 ft., Aux Vases 3,062 ft., Fredonia 3,135 ft.

Texas Co. 1 Greathouse, E½ SW SE NW 27-1n-6e, old well drilled deeper from 3,094 ft. to 5,200 ft., dry. Devonian lime top 5,013 ft.

APPALACHIAN FIELD

U. N. G. Increases Gas In Deep Trenton Test

PITTSBURGH.—In Mercer County, western Pennsylvania, United Natural Gas Co. increased the gas in the deep Trenton test on Maude Davidson farm in Worth Township at 8,582 ft., where an additional 118,000 cu. ft. of gas was struck. Trenton was topped at 8,178 ft. with the first gas gaging 50,000 cu. ft. at 8,200 ft. It is now drilling at 8,730 ft.

On Chestnut Ridge in Wharton Township, Fayette County, Grennsboro Gas Co. struck a second gas pay in the Onondaga chert at 7,093 ft. in the 5 Barton which increased the gage to 915,000 cu. ft. where it was shut down for test. This is 270 ft. below the top of that member and an abnormally thick section. In this township but east of the crossroads on the Summit, New Penn Development Co. topped the Brown shale at 6,690 ft. in the test on Thompson tract or subsea 4,374 ft. which makes the test appear very low on structure.

In Nicholson County, West Virginia, Columbian Carbon Co. completed 759 C. C. Dickinson in Jefferson district or the No. 4 in the new pool with a gage of 1,917,000 cu. ft. after acidizing the Big Lime. It rocked up to 530 lb. in 36 hours. This completes five wells on the tract with No. 5 casing in the Big Lime at 1,412 ft. and No. 7 drilling at 1,155 ft. Locations are being prepared for five more. It opens up a new gas pool which appears of considerable size. The completed wells range in size from just over 1,000,000 to over 4,000,000 cu. ft.

In Fayette County, the test of Columbian Carbon Co. on Gauley Mountain Coal Co. in Falls district was dry through the Berea to a total depth of 2,252 ft.

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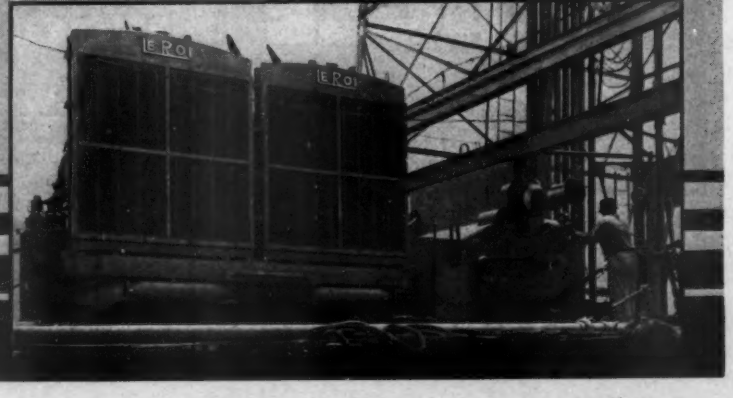

CANADIAN FIELDS

Seven Rigs Running at Fort Norman Field

CHATHAM.—Exploratory work is being continued in the Fort Norman field with seven strings of tools. Of the 33 producing wells already completed, 7 are meeting the capacity requirements of the pipe line to White Horse, the others being shut in.

Jumping Pound.—In the Jumping Pound area west of Calgary, Shell Oil Co. 4-24-J, LSD 4, 24-25-5w5, is below 9,447 ft., after entering the Kootenay formation at 9,331 ft. The log indicates the well is 2,000 ft. higher than the company's first well, which encountered water in the Madison around 12,000 ft.

Coalspur.—On the Coalspur structure in the northern Alberta foothills, Imperial-Coalspur 1, LSD 10, 3-49-21w5, is coring from 9,400 ft. after encountering a substantial gas flow under heavy pressure in the lower Benton formation.

Southern Alberta.—A survey of southern Alberta shows four areas with definite production. In the northernmost, the eastern Taber field, a total of 13 wells with 7 producers have delimited a small field. A similar local pool, not yet delimited, is indicated in the western Taber area. Both yield a heavy 18°-gravity crude.

In the Conrad field, to the southeast, three wells yielded two producers with about 320 bbl. daily of 25°-gravity crude, and a large field may be developed. The Steveville-Princess area has a good production of high-grade crude from one flowing well recently completed in the Devonian limestone. Three other tests are drilling. Mid-Continent-Universal 1, a Devonian test nearing completion in the Taber area, may alter the outlook for that field. A third Devonian test is drilling in the Twin River-Del Bonita area near the Montana boundary.

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CALIFORNIA

Western Gulf Discovery In Kern County

LOS ANGELES.—Western Gulf Oil Co. discovered a new oil field about 2 miles northwest of the northern tip of the Mountain View field in Kern County by completing 1 Cohn in Section 3-30s-28e flowing 55 bbl. of 16.2°-gravity oil daily from the Wicker zone. Production was still cutting 6 per cent water and 30 per cent emulsion but appeared to be cleaning up in good shape. This discovery was made in the so-called Bakersfield sewer farm area. This new well was carried down to 6,278 ft., and after landing 7-in. casing at 5,898 ft. it was gun perforated at 5,785-5,805 ft. Several wildcats have been drilled in this general area but in every case the holes were not carried deep enough to have picked up Gulf's new zone so that all these old wells can be eliminated in estimating the probable importance of the new discovery.

R. E. Havenstrite, discoverer of the Del Valle field in Los Angeles County, appears to have made a new important discovery in the east end of the field or east of the Del Valle field. The latter appears more logical due to a pinch out of the oil sand between the present outpost well and existing production. The new discovery was made in 2 Liebhart which on a formation test of 107 minutes' duration, flowed at a daily rate of 400 bbl. of clean 60°-gravity oil and about 15,000,000 cu. ft. of gas. This formation test was made at 7,951-8,017 ft., upon the conclusion of which drilling was resumed.

North American Oil Consolidated has completed its well No. 81 in Section 2-32s-23e which blew in a couple of weeks ago flowing between 5,000 bbl. and 10,000 bbl. daily and ran wild for several days before being brought under control and has cut back production to 525 bbl. daily by producing through a small bean. The most interesting of these blowouts in the Buena Vista Hills is Standard Oil Co. of California's well No. 325-26-B in Section 26-31s-23e, as the blow in this well, ranging from 25,000,000 cu. ft. to 40,000,000 cu. ft. of gas daily, has reduced gas pressures throughout the field very materially. This well continued its wild blowout for 6 days.

In the South Coles Levee field of Kern County, Standard was within 17 ft. of reaching 16,000 ft. At last reports, the well was still in Miocene formations.

CALIFORNIA WILDCAT COMPLETIONS

Cottonwood Creek wildcat district, Kern County: Richfield 1 Olcese Cottonwood, 20-29s-30e, abandoned in basement material, no showings, TD 2,114 ft.

Edison outpost well, Kern County: Richfield 1 King, 31-30s-30e, dry in granite, no showings, TD 1,566 ft.

Northwest Mountain View outpost well, Kern County: Western Gulf 1 Cohn estate, 3-30s-28e, flowed 55 bbl., 16.2°-gravity, 6 per cent water, 30 per cent emulsion, cleaning up, TD 6,278 ft., PB 5,898 ft., perf. 5,785-805 ft., completed in Wicker sand. New oil discovery.

Raisin City outpost well, Fresno County:

Seaboard-Superior 5-5 Raisin City, 5-15s-17e, abandoned as wet, form. test 6,231-34 ft. recovered 1,800 ft. salt water testing 1,100 g/g. only trace of oil, TD 6,447 ft.

N. CENTRAL TEXAS

New Caddo Lime Pool Near Wichita Falls

WICHITA FALLS.—Opening Caddo lime production in the area 5 miles west of Wichita Falls, James Stewart & Co., Inc. 3 E. B. Madden, Block 8, William Mayer Survey, was completed flowing 360 bbl. 40-gravity oil in 6 hours through ½-in. choke, gas-oil ratio 990 to 1, after using 1,000-gal. acid treatment on the pay through perforations at 5,072-92 ft., with total depth 5,131 ft.

The Texas Co. 1 Bell, Foard County wildcat 3 miles southeast of Crowell, recovered 6 ft. of conglomerate showing oil and 2 ft. of shale in core from 5,417-25 ft., then made a 30-minute drill-stem test from 5,415-25 ft., recovering 55 ft. of oily salt water, and prepared to drill ahead.

A new Caddo conglomerate producing area apparently has been found in northwestern Clay County at Anderson-Prichard Oil Corp. 1-A Wood, Section 12, MEP&P Survey, 10 miles northwest of Henrietta. It topped Caddo at 5,884 ft., topped conglomerate at 5,937 ft., made 11-minute drill-stem test 5,937-45 ft., showed gas after 9 minutes, and recovered 300 ft. of oil. After drilling ahead it logged conglomerate showing oil 6,026-35 ft., made a 15-minute drill-stem test 6,018-35 ft., had a show of gas and recovered 70 ft. of oil-cut mud. It is preparing to drill ahead.

In southwestern Cooke County, just west of the recent Kadane-Griffith 1 Hopkins shallow discovery, Phillips Petroleum Co. 1 Reitar, in Section 18, J. M. Culp Survey, drilled and cored sand and conglomerate showing oil, with shale breaks, from 3,000-29 ft., made a 30-minute drill-stem test at 3,003-29 ft., recovered 345 ft. of gas and oil-cut mud and 300 ft. salt water. It is drilling ahead past 3,041 ft. in shale. In same area, A. G. Hill 1 L. M. Atcheson is a new 3,500-ft. wildcat location 330 ft. from north and east lines W. D. Easley Survey A-1,481.

NORTH CENTRAL TEXAS WILDCAT COMPLETIONS

Archer County: D. H. Bolin 1 John Purcell, Blk. 75, Jefferson CSL, 2 mi. N and 1½ mi. E Anarene, dry, TD 1,205 ft.

H. M. Kelleher 1 C. L. Abercrombie, Wm. Cound Sur., 3½ mi. W and 1 mi. S Archer City, dry, TD 1,390 ft.

White & Duncan 1 J. T. Richardson, Lot 10, Jonathan Scott Sur. A-374, 6 mi. N and 2 mi. W Olney, IP 10 bbl. dry, TD 1,400 ft.

Clay County: Bridwell Oil 1 N. J. Ewers, Jr., Blk. 14, John M. Rine Sur. A-385, 3 mi. W and 3 mi. S. Halsell, elev. 938 ft., Caddo 5,352 ft., dry, TD 5,424 ft.

Fain & McGaha 1 O. O. Ross, Sec. 7, BBB&C Sur. A-49, 5 mi. S and 2 mi. W Jolly, Caddo 5,402 ft., IP 822 bbl. day through ½-in. on 2-in., gravity 43°, gas-oil ratio 750 to 1, TD 5,680 ft.

Cooke County: Trumter Petroleum 1 R. M. Lawson, Harriett Nail Sur. A-790, ½ mi. SE Hood, dry, TD 1,457 ft.

Haskell County: Humble 1 J. D. Hughes, Sec. 4, Blk. 14, H&TC Sur., 4 mi. W and 1 mi. N Rochester, elev. 1,609 ft., dry, TD 5,121 ft.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Callahan County: T. D. Humphrey 1 J. E. Scott est., Sec. 2, Blk. 1, SPRR Sur.,

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12 mi. SW Clyde, elev. 1,991 ft., dry, TD 3,115 ft.

Coleman County: Anzac Oil et al 1 A. E. Watson, A. Quigley Sur. No. 739, 3 mi. SE Coleman, elev., 1,702 ft., dry, TD 2,352 ft.

Jones County: M. M. Travis et al 1 A. A. McDuff, Sec. 24, Orphan Asylum Land, 5 mi. E Anson, elev. 1,708 ft., dry, TD 2,446 ft.

EASTERN TEXAS

Wood County Wildcat Swabs Heavy Oil

DALLAS. — Bobby Manziel 1 Evans, Wood County wildcat 2 miles east of Quitman, recovered mud and 27-gravity oil as it started swabbing after perforating pipe at 4,914-44 ft., opposite part of the sub-Clarksville sand section. Total depth of the hole is 6,100 ft., with 5½-in. casing cemented at 5,063 ft. Amerada Petroleum Corp. 1 Gamblin, in B. Lee Survey, about a quarter mile northeast of Gulf 1 Brewer, Winnsboro field discovery well, was drilling below 8,764 ft.

In Henderson County, Lone Star Producing Co. 1 Lee, 3 miles north of Athens, which has indicated high-gravity oil production from Bacon lime at 8,202-08 ft., ran electric log at 8,400 ft., and then drilled ahead below 8,493 ft., with no shows reported below the Bacon zone. In same county, Gulf Oil Corp. 1 Frizzell, deep test a mile east of Baxter, was drilling at 6,205 ft., and The Texas Co. 1 Morse, a mile south of Chandler, was drilling lime and shale at 8,171 ft.

A Navarro County wildcat, J. B. Daniels 1 Wayne Milligan, Martin Latham Survey, 3 miles east of Richland, logged 2 ft. of oil sand, topped at 3,164 ft., in drilling to total depth of 3,172 ft. in sand and shale, and has cemented 5½-in. pipe at 3,167 ft. Elevation is 372 ft.

East Texas border.—Stanolind and Continental 1 Harris, 3 miles southeast of Woodlawn, recovered 110 ft. mud with possible distillate odor on drill-stem test at 5,691-5,711 ft.; on a second test at 5,943-68 ft. recovered salt water with no shows, and was drilling below 6,158 ft. In Panola County, the deep test of McAlester Fuel Co. 1-A Hunt, southeast of Carthage, was drilling below 8,707 ft. with no shows reported. It topped Cotton Valley at 8,114 ft. Skelly Oil Co. 1 Werner Sawmill Co., wildcat 2 miles north of Deadwood, was coring for the Hill zone at 5,108 ft. In Shelby County, Humble Oil 1 Pickering, Huxley area, was drilling at 4,820 ft. in hard lime.

EAST TEXAS WILDCAT COMPLETIONS

Hopkins County: Humble 1 C. D. Nichols, Isaac Friddle Sur. A-333, 2½ mi. S Pickton, elev. 472 ft., Bacon lime 7,866-98 ft., Pittsburgh 8,540 gt., Travis Peak 8,570 ft., top pay 7,888 ft., flowed 620 bbl. day through ¼-in. tubing choke, gravity 50.2°, gas-oil ratio 1,349 to 1, TD 8,853 ft.

Hunt County: Hollandsworth Drlg. and Stanolind 2 C. H. Kimbell, James Cole Sur. A-152, 2½ mi. N and little E Campbell, elev. 587 ft., dry, TD 4,507 ft.

OHIO, KENTUCKY

W. Zanesville Gas Pool Gets East Extension

COLUMBUS. — The Brendel Producing Co. 1 Maple Acres Consolidation, 4th Qr., Falls Township, Muskingum County, an east extension to the West Zanesville pool, gaged 2,300,000 cu. ft. natural from the Clinton sand at 3,555-3,585 ft. A well is drilling to the north of the pool to test for a northeast extension.

Three shallow sand gas wells were completed, which will encourage further drilling in their respective areas. Tavern Oil & Gas Co. 1 C. D. McKinney, Section 21, Seneca Township, Monroe County, opened up a Keener pool with a 1,380,000-cu. ft. well at 935-1,026 ft. Hall & Henning 1 Joe R. Herlen, Section 33, Independence Township, Washington County, gaged 859,-000 cu. ft. in the Third Salt sand at 1,330-65 ft. McTaggart et al 2 Priscilla Needham, Section 11, Dunham Township, Washington County, gaged 497,000 cu. ft. from the Maxon at 1,125-38 ft.

OHIO WILDCAT COMPLETIONS

Monroe County, Seneca Township: Tavern Oil & Gas 1 C. D. McKinney, Section 21, Keener 935-1,026 ft., 1,380,000 cu. ft. gas, TD 1,026 ft.

WESTERN KENTUCKY

OWENSBORO. — In an otherwise uneventful week in Western Kentucky fields, Sinclair Prairie Oil Co. found some saturation in Cypress sand at 2,263-93 ft. in a wildcat 3 miles west of the Smith Mills pool in Henderson County. A drill-stem test recovered 5 ft. of oil and 96 ft. of drilling mud.

EASTERN KENTUCKY

ASHLAND.—Four gas wells were completed in Eastern Kentucky during the week with several others nearing the completion depth. Operations pointed upward with a number of new locations being reported.

The Inland Cas Corp. reported completion of well No. 263, on the J. H. Hammons land on Bull Creek of Licking River in Magoffin County, at 1,597 ft. The well has a daily open flow of 396,000 cu. ft. of gas from Keener.

The Kentucky West Virginia Gas Co. has completed three wells as follows:

No. 768, Winston Thornsbury, Gibson Creek of Caney Fork, Knott County, 2,585 ft. total depth, shale, 492,000 cu. ft. of gas daily, open flow.

No. 5,511, Sam Childers, Shelby Creek, Pike County, 1,905 ft. total depth, 858,000 cu. ft. gas daily, open flow, from Maxon and 298,000 cu. ft. from Salt sand.

No. 5,549, Wesley Reynolds, Runnels Fork of Troublesome Creek, Knott County, 3,060 ft. total depth, 280,000 cu. ft. gas daily, open flow, from shale, and 21,000 from Big Lime.

INDIANA

EVANSVILLE.—Superior Oil Co., trying to find oil in deep formations on a lease in the New Harmony pool in Posey County, abandoned the test, in 17-5s-14w, at 3,135 ft., a dry hole. The company was moving in tools for another deep test in Section 3-5s-14w.

INDIANA WILDCAT COMPLETIONS

Posey County: Superior Oil 35 New Harmony Realty, SW NE NE 17-5s-14w, dry at 3,155 ft. Upper Menard 2,153 ft., Glen Dean 2,407 ft., Aux Vases 2,907 ft., Ste. Genevieve 2,936 ft., McClosky 3,135 ft.

Spencer County: Texas 1 Dr. Hanning, SW SW NE 2-5s-5w, dry at 1,133 ft. Tar Springs 545 ft., Barlow 787 ft., Cypress 811 ft., Benoist 845 ft., Ste. Genevieve 919 ft.

ROCKY MOUNTAIN

Another Tensleep Strike For Fremont County

DENVER.—Sinclair-Wyoming Oil Co. 1 Unit, SW NW NW 14-32n-95w, deep test of the Big Sand Draw gas field, flowed 21 bbl. per hour of 35.5°-gravity oil from the Tensleep sand. The test topped Tensleep at 7,285 ft., set 7-in. at 7,281 ft., and drilled to 7,338 ft., then made drill-stem test with packer at 7,266 ft. Opened for 2 hours, it made 6,662 ft. of greenish brown oil of 35.5° gravity, then started flowing at the rate of 21 bbl. per hour.

Steamboat Butte.—The Lakota sand discovery on the Steamboat Butte dome, Fremont County, Wyo., in British-American Oil Producing Co. 4-E Tribal, NE SE NW 5-3n-1w, perforated with 72 holes at 4,524-46 ft. and swabbed 50 bbl. per hour of 38°-gravity oil. It is being killed to continue on down to the Sundance. Location is half-mile southeast of the Sundance sand discovery and a mile southeast of the discovery in the Tensleep.

Small well at Cooper Cove.—Stanolind

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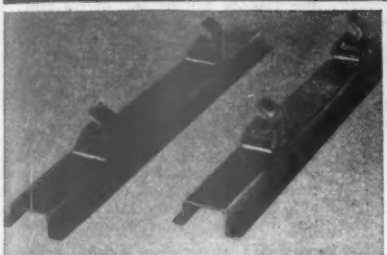

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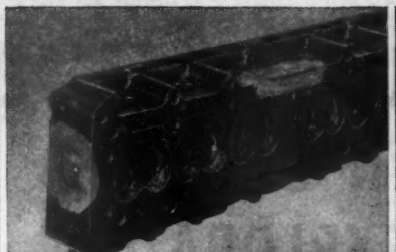

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Name_____ Position_____

Company_____ Address_____

Oil & Gas Co. 2 Johnson-Parkinson, NE SW NW 20-18n-77w, Cooper Cove structure, Carbon County, Wyoming, one-half mile northwest of the Dakota sand discovery, swabbed only 89 bbl. of oil with 103 bbl. of water in 24 hours from the Dakota. The structure is a very narrow anticline on the Rock River fold. Following the discovery last May, which swabbed 262 bbl. in 24 hours and then flowed, the operator found a dry hole in 1 Union Pacific three-fourths of a mile to the northwest. Rig was then moved 1,320 ft. to the east for the third test with results noted above.

Gas show south Elk Basin.—Continental Oil Co. wildcat on South Elk Basin, 3 miles south of the nearest Tensleep producer in Elk Basin, 1 Ida Goodstein, NE SE SW 20-57n-99w, topped the second Frontier at 4,354 ft., and in a drill-stem test at 4,354-90 ft., open 16 minutes, showed dry gas at the rate of 3,000,000 cu. ft. a day. The first Frontier had water. It is coring ahead at 4,402 ft.

Clark's Fork wildcat.—General Petroleum Corp. 1 Government, C NW NW 25-9s-22e, Carbon County, Montana, 6 miles northwest of Elk Basin field, which had a show of oil and mud-cut gas in the first Frontier at 6,457-90 ft. in a drill-stem test before the tester was unseated, took another at 6,461-90 ft., open 30 minutes, recovered 2,430 ft. of gas-cut mud and a show of oil. The 7-in. was cemented at 6,448 ft., and plug is being drilled. After testing the sand, operation will shut down until spring.

Rangely field extended.—California Co. 1 McLaughlin-Government, SE NW 24-2n-103w, Rangely field, Colorado, encountered saturation at 5,960 ft. in what appears to be the top of the Weber formation and may extend the pool 1¾ miles northwest of the discovery. The total depth is 6,047 ft., and the 7-in. was cemented at 5,960 ft., on top of the pay.

Tensleep test at Midway.—Following conclusion of title litigation on the Midway structure 10 miles northeast of Casper and 22 miles south of the Salt Creek field, The Kerlyn Oil Co. will take over the operation, drill an 8,300-ft. test to the Tensleep and recondition and put on production three wells in the field producing from upper horizons. The deep test will be 1 Kerlyn-Government, NE SE NE 23-35n-79w.

WYOMING WILDCAT COMPLETIONS

Carbon County, Cooper Cove: Stanolind 2 Johnson-Parkinson, NE SW NW 20-18n-77w, TD 4,854 ft., completed in the Dakota for 89 bbl. of oil and 103 bbl. of water in 24 hours, swabbing.

Fremont County, Dry Creek: Sinclair-Wyoming 1 Tribal, NE NW SW 27-6n-3w, TD 4,191 ft., dry, drilled through an overthrust, topping the Sundance at 2,203 ft., again at 3,960 ft., structure dipping 50 degrees near bottom.

Niobrara County, East Lance Creek: Continental 1 Mills, SW SE NW 27-36n-64w, TD 4,018 ft., tested Dakota sands through perf. at 3,911-46 ft., 3,906-18 ft. and down to bottom, all showing water, dry.

MONTANA WILDCAT COMPLETION

Teton County, Farmington: Union Oil of California 1 State, NE SW SW 27-25n-3w, TD 1,600 ft., plugged back to 1,560 ft., Bannatyne sand at 1,475-1,515 ft., shot with 130 qt., dry.

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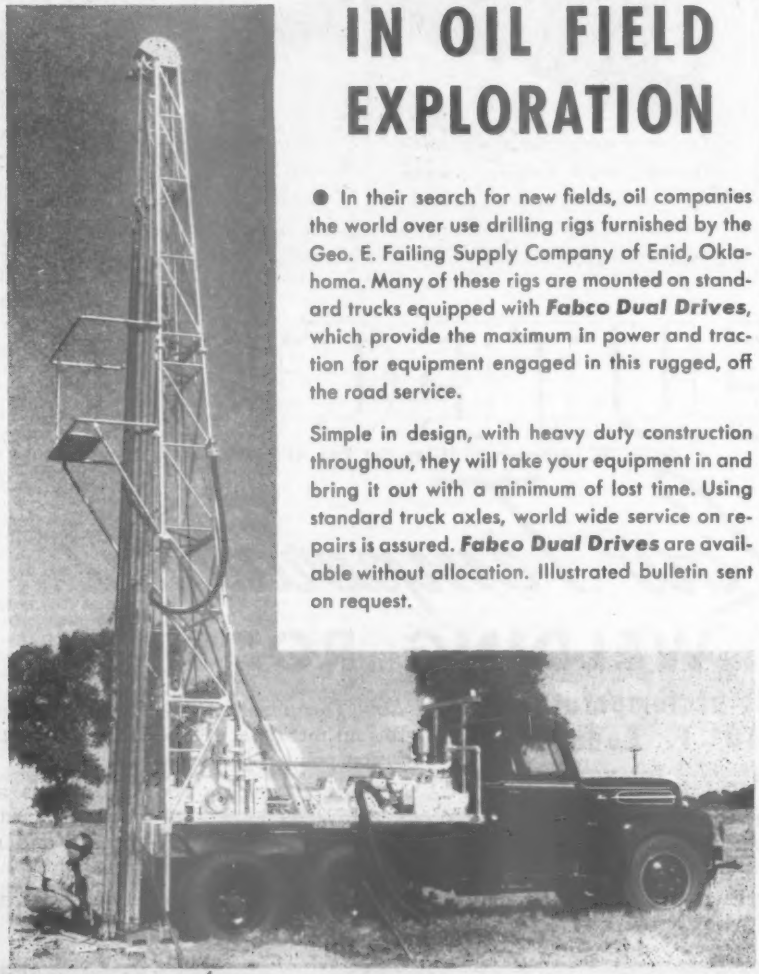

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OKLAHOMA

W. Edmond Well Allowable May Be Reduced

RELEASE of data on results of engineering tests of the West Edmond field makes it probable that there will be little opposition to a proposal that the Corporation Commission reduce the per-well allowable from the present 200 bbl. daily to 150 bbl. The report indicated an average 64-lb. pressure drop in 31 wells between August 20 and November 18; that gas caps may be developing in parts of the field; and that 12 wells in the southwest part of the field are cutting salt water, with a possible tendency for the water encroachment to extend north along the Oklahoma-Canadian County line.

Pipe-line runs averaged 45,000 bbl. daily from 240 connected wells; with the field tally showing 254 completed oil wells, 23 preparing to test and complete, 100 rigs making hole.

Garvin County.—Skelly Oil and Tide Water Associated Oil Co. 1 Rakestraw, SE SW SE 4-4n-3e, north of Stratford, was flowing 20 to 25 bbl. per hour of clean oil from a lime in the Pennsylvanian at 2,490-2,500 ft. The well was drilled to 3,408 ft., and found both Wilcox sands dry, before plugging back to the present producing horizon.

McClain County.—A 12,000-ft. wildcat test, Cities Service-Phillips Petroleum-Mid-Continent Petroleum Co. 1 Lawson, SW NW 22-5n-4w, has been staked west of Payne in southwestern McClain County. The objective is Wilcox, expected at between 11,000 and 13,000 ft.

Noble County.—With Shell Oil Corp. as operator, a Wilcox producer in the Lucien pool will be deepened to test the Reagan sand below the Arbuckle; involving deepening from the present producing depth of 5,274 ft., to about 7,000 ft. The well, 1 Magney, SW SW 17-20n-2w, is on a

community block, shared with Shell by Cities Service, Phillips Petroleum, Gulf, Sinclair Prairie, Sun, Carter and L. H. Wentz.

OKLAHOMA WILDCAT COMPLETIONS

Cleveland County: California 1 Wilson, NE NE SE 27-10n-1e, dry, TD 6,390 ft., second Wilcox 6,338 ft.

Okfuskee County: Public Service 1 Palmer, SW SE NW 4-10n-10e, dry, TD 3,459 ft., Cromwell 3,430 ft.

Okmulgee County: Creekmore-Rooney 1 Bruner, SE NE NW 13-15n-12e, dry, TD 2,715 ft., Wilcox 2,705 ft.

Osage County: Norbla 2, NW NW SW 4-24n-6e, dry, TD 2,899 ft., May 2,888 ft.

KANSAS

Gas Wells Dominate Week's Completions

GAS producers moved into the limelight this week, with 10 gas wells completed for more than 150,000,000 cu. ft. daily. One of these gas wells was the discovery, Carter Oil Co. 1 Strong, NW SE 27-22-35w, 7 miles southwest of Nunn pool in Finney County. The well gaged 13,510,000 cu. ft. in 1 hour from three horizons, Herington, Krider and Winfield. Of the nine remaining, eight were in the Hugoton field, one was in the Yoder pool.

Barber County: Lion Oil Co. 1 Allen, NW NE NE 2-30-14w, has recovered free oil from the Arbuckle on a drill-stem test. This well is particularly interesting because of the absence of the Upper Ordovician. Lansing was topped at 3,949 ft., Viola and Simpson were missing, and Arbuckle was cut at 4,437 ft. Pipe has been set at 4,572 ft.

Ellis County: Bridgeport Oil Co. 1 Sessin "A," SE SW SE 15-11-19w, about 2 miles northeast of the Solomon pool, is waiting on cable tools after getting a good show of oil in the last 6 ft. of hole. Total depth at present is 3,462 ft. Lansing was cut at 3,142 ft., Simpson at 3,448 ft., and Arbuckle at 3,453 ft.

Russell County: The Hall-Gurney pool has been extended to the north by El Dorado Refining Co. 1 Reine, SE SE NE 19-14-13w. At 3,196 ft., the hole filled with 1,720 ft. of oil in 12 hours, after acidizing with 500 gal. Production will be from the Arbuckle, which was topped at 3,191 ft. The well is being put on pump.

Operations picked up a little with 41 new starts reported, including 15 wildcats. New locations for wildcats are distributed among 12 counties, Marion County having three, Ellsworth having two, and one apiece scheduled for Barber, Butler, Cowley, Doniphan, Ellis, McPherson, Rice, Saline, Sedgwick and Stafford counties.

KANSAS WILDCAT COMPLETIONS

Barber County: Phillips 1 Wheatley, NW NW NW 10-34-14w, dry, TD 5,307 ft., crystalline Viola 5,125 ft.

Cowley County: Mark Adams and Wakefield 1 Adams, E/2 NE NW 2-30-5e, dry, TD 2,860 ft., Mississippi lime 2,842 ft.

Rice County: D R M Drilling 1 Behnke, SE SE SW 36-18-10w, dry, TD 3,370 ft., Arbuckle 3,334 ft.

Skelly 1 Ruhl, NE SE NW 17-18-9w, dry, TD 3,270 ft., Arbuckle 3,259 ft.

Sedgwick County: Beech Aircraft 1 Cartwright, SW NE NE 21-28-2e, dry, TD 3,081 ft., Mississippi lime 3,000 ft.

Stafford County: Derby-Bothwell 1 Gilmore estate "A," SW SW SE 29-23-14w, dry, TD 4,095 ft., Arbuckle 4,077 ft.

Phillips 1 Vivian, NE NE SE 12-23-12w, pyhsical potential 330 bbl. per day

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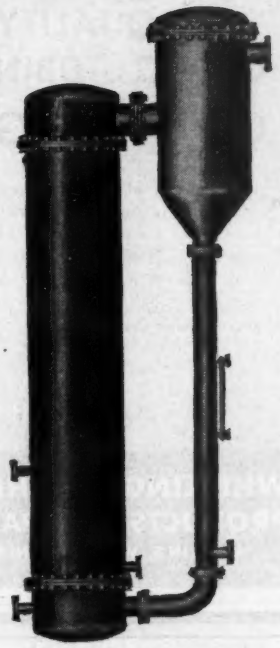

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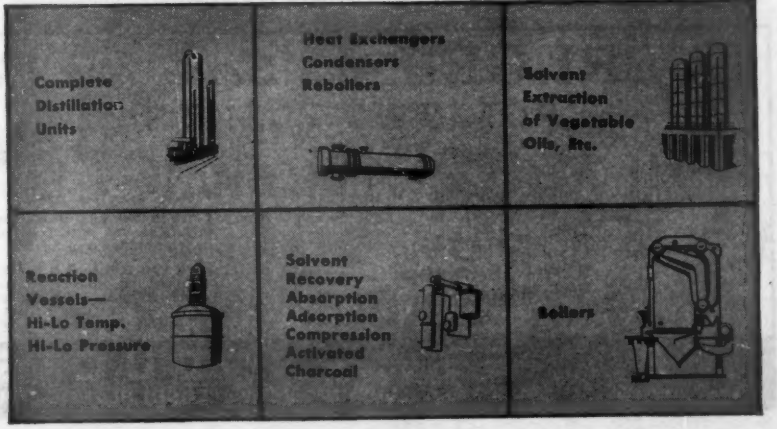
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from pay zone 3,680-84 ft., TD 3,684 ft., Arbuckle 3,679 ft.

Sumner County: Texas 1 Cramer, SW SE NE 8-32-2w, dry, TD 4,464 ft., Arbuckle 4,401 ft.

Trego County: Texas 1 Roberts, SW SW SE 4-12-22w, dry, TD 4,200 ft., Arbuckle 4,089 ft.

FOREST CITY BASIN

ST. JOSEPH.—Clifton Gall's 1 Livengood, wildcat producer in NE NW SW 3-1s-15e, Brown County, Kansas, about 5 miles southwest of the Falls City, Neb., field, responded to the second acidizing—350 gal.—with 2,370 ft. of oil in the hole after a 12-hour shutdown. Operators swabbed 12 bbl. of oil in 1½ hours and then started to build tanks. This is the first production for the county.

Drilling started at another Northeast Kansas well, Fred D. Culpepper 1 Lamporter in S½ SW SE 3-2s-14e, Nemaha County, about 1½ miles west of Sabetha. Last year The Ohio Oil Co. drilled on the same lease and had quite a showing of oil, but too much water for production.

A first report location in Doniphan County, Kansas, also in the northeast part of the state, is R. L. Ferguson et al 1 Boeh in SE SW 32-2s-22e, about 5 miles north of Wathena. A machine was being moved in.

PERMIAN BASIN

Terry and Lamb County Discoveries Are Testing

MIDLAND. — Fikes & Murchison 1 Alexander, new strike in northwestern Terry County, swabbed 1½ bbl. oil hourly from total depth 5,157 ft. in lime, natural, and is scheduled for acid treatment. Farther north, in Lamb County, Humble Oil & Refining Co. 1 Jackson, which swabbed 12 bbl. oil hourly after treating with acid at plugged back depth 6,050 ft., is cleaning out 46 ft. off bottom with 5,000 ft. oil in hole. In southeastern part of the basin, in Reagan County, Superior Oil Co. of California, Wiggins & Hyde B-1-A University, Section 12, Block 1, University Lands, had slight shows of gas and oil in water blanket and mud for drill-stem test at 8,569-8,632 ft. Later, a core from 8,701-16 ft. recovered 13½ ft. of shale with 1 ft. of brown limestone, finely crystalline, bleeding distillate. It drilled ahead past 8,728 ft., and is believed to be in lower Permian at that point. In Gaines County, Shell Oil Co., Inc., 1 Sparks, total depth 10,604 ft. in dolomite, is running 5½-in. casing to test.

Locations have been announced for important new wildcats throughout the basin. In Hockley County, on the north edge of the Slaughter field, Texas Pacific Coal & Oil Co. 1 Rucker, southwest corner Labor 16, League 43, Rains CSL Survey, will be deepened to 8,000 ft. after failing in the field's regular pay zone. Gulf Oil Corp. will drill a 7,500-ft. wildcat about 4 miles southwest of Slaughter field production at its 23 Mallet, in Section 2, Block X, PSL Survey, also in Hockley County.

In Gaines County, Amerada Petroleum Corp. 1-A Jones, a 9,500-ft. wildcat, was staked in NW NE Section 3, Block A-6, being 5½ miles north of Continental 1-A Jones 12,222-ft. dry hole. In same county, Bay Petroleum Co. 1 Cox, SE SE Section 468, Block G, 8 miles south of the Russell pool, has resumed operations and will go to the Fullerton zone, or 7,600 ft., after having been abandoned several months ago at 5,223 ft.

In Crane County, Gulf Oil Corp. 7-E McKnight is a new Ellenburger wildcat in SE SE Section 9, Block B-21, several miles north of nearest Ordovician production. In Glasscock County, Richfield Oil Corp. 1 Blalock was spotted in SW NE Section 7, Block 35, T-3-S, 4 miles east of 1 Woody, a dry hole.

Hunt Oil Co. is starting two wildcats in the Lamb County area opened by Humble 1 Jackson. Hunt 1 Snitker, SE SE Section 31, Block 1, is ½ mile west and north of the discovery and Hunt 1 Foust, SE NE Section 43, Block 1, is 4½ miles north of the discovery and a scheduled 8,500-ft. test.

Hunt Oil Co. is also planning to start a 6,000-ft. wildcat in Nolan County, 1 Arthur Sears estate, NE SW Section 30, Block 20, T&PRR Survey, 7 miles east of Sweetwater. In Val Verde County, Texas Gas Utilities Co. 1 Holman estate, is planned as a 5,000-ft. test 5 miles south of Comstock.

WEST TEXAS WILDCAT COMPLETIONS

Garza County: Honolulu and Devonian 2 D. R. Payton, Sec. 1,421, TTRR Sur., 12 mi. NW Post, elev. 2,976 ft., dry, TD 3,759 ft.

Pecos County: Standard Oil of Texas 1 F. H. Bonebrake, Sec. 49, Blk. 1, H&GN Sur., elev. 2,562 ft., dry, TD 2,897 ft.

TEXAS PANHANDLE

AMARILLO.—Humble Oil & Refining Co. 1 Hyslop, Deaf Smith County wildcat, was bottomed at 6,595 ft. in granite wash, where it had drill pipe stuck on bottom, and was cutting and washing down.

SOUTHEASTERN NEW MEXICO

HOBBS.—Atlantic Refining Co. 1 Stephens, wildcat in 33-14-33, northwest Lea County, topped solid lime at 4,110 ft., and is drilling below 4,520 ft. McLaughlin and Cosden 1 State, wildcat in 2-17-32, had slight show of oil in red sand topped

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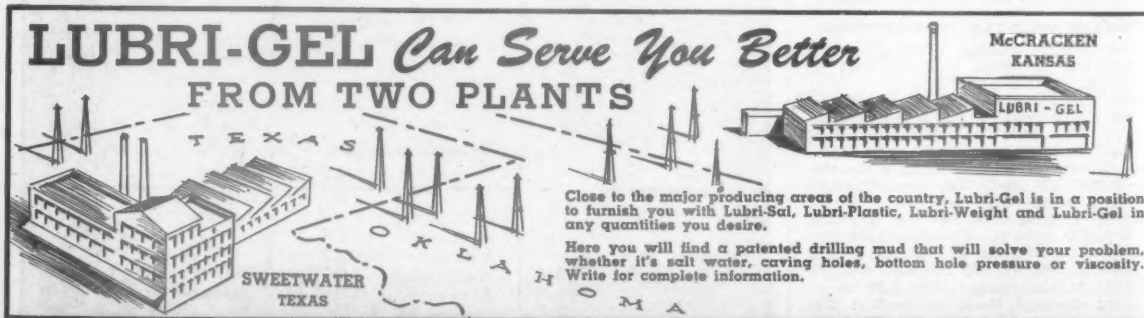

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at 3,395 ft., and is drilling below 3,612 ft. Continental Oil Co. 2-B-23 Skaggs, east of Monument, after plugging back from granite, has perforated casing at 9,872-92 ft. and is preparing to swab. Humble Oil 1 Federal-Keinath, east of Eunice, is drilling past 9,143 ft. in shale and lime. Humble Oil 1 Federal-Leonard, recent Ellenburger discovery below 10,000 ft., on last full 24-hour gage made 189.24 bbl. pipe-line oil through 3/32-in. tubing choke with 1,300 lb. tubing pressure, 2,300 lb. casing pressure.

LA.-ARK.

Richland Parish Strike Stirs Louisiana Interest

SHREVEPORT.—The probable discovery of a new oil field in northeast Louisiana is the highlight of activity in this area at present. C. H. Murphy and Sun Oil Co. 1 J. E. Holt, NW SE 21-17n-9e, in Richland Parish, 9 miles east of Rayville, found 21 ft. of saturated sand at 3,273 ft., and on a drill-stem test recovered 2,000 ft. of 37.6°-gravity oil.

The Haynesville pool community deep test, Ohio Oil Co. 1 G. W. Taylor, Account 4-P, center SE 15-23n-8w, is flowing 375 bbl. per day of 43.8°-gravity oil, gas-oil ratio 1,068 cu. ft. through 16/64-in. tubing choke. Production is from perforations in sand at 8,835-75 ft., and 8,910-20 ft., stated to be 1,150 ft. below the Bodcaw sand of the Cotton Valley, and 1,650 ft. below the top of the Cotton Valley formation.

NORTH LOUISIANA WILDCAT COMPLETIONS

Bienville Parish: George H. Pierce et al 2 Merritt, NE NW SW 13-17n-7w, dry, TD 3,700 ft.

Sabine Parish: J. L. Perry, Tr. 1-A 4-L Company, 450 ft. north and east of SW NE SW 29-8n-10w, dry, TD 2,019 ft.

MISSISSIPPI

Gulf's Mullens Test Makes Gwinville Look Better

JACKSON, Miss.—Gulf Refining Co. 1 Mullens, 660 ft. north and east of SW cor. NW NE 34-9n-19w, Jeff Davis County, has given the Gwinville area very promising signs of importance. A 25-minute drill-stem test in 21 ft. of porous sand at 9,225-46 ft. developed 5,500 ft. of 39.5-gravity oil, considerable gas and 60 ft. of salty water and mud in the 4½-in. drill stem. Coring was resumed. Total depth was 9,270 ft., and still coring.

The sand correlates about 100 ft. above the top of the Massive sand found in the S. W. Richardson's discovery well 1 Berry, which was good for about 50 bbl. of 54-gravity condensate and 5,000,000 cu. ft. of gas from pays at 7,855-80 ft. and 8,075-8,106 ft., total depth 9,967 ft.

Gulf's 1 C. V. V. Cooper, C NE NW 7-1n-16w, Baxterville area, Lamar County, was completed from perforations at 8,690-8,714 ft. and 8,734-44 ft., in Massive sand. The well flowed 260 bbl. of 16.5-gravity oil in 15 hours through ¼-in. choke, and later flowed 444 bbl. in 17½ hours through various chokes and through tubing.

In the Eucutta field in Wayne County, Gulf Refining Co. 1 Walters Leggett, SE NE 35-10n-9w, flowed 178 bbl. the first 24 hours through perforations at 5,009-18 ft.

Frank and George Frankel 1 Carrie Husband et al, 681 ft. north and east of SW cor. NW 29-1n-13e, Heidelberg field, Jasper County, was completed flowing 392 bbl. of oil through 20/64-in. tubing choke through perforations at intervals from 4,811 to 5,015 ft.

MISSISSIPPI WILDCAT COMPLETION

Scott County: Sinclair-Wyoming 1 Kirsch estate, 660 ft. north and west of SEC 26-6n-6e, dry, TD 7,510 ft., Massive sand 7,163 ft.

ALABAMA WILDCAT COMPLETION

Washington County: Texas 1 Stallworth Naval Stores, 120 ft. west of C 10-3n-3w, dry, TD 8,368 ft., Lower Cretaceous 7,893 ft.

WILDCAT COMPLETIONS AND DISCOVERIES

	Week ended Nov. 25, 1944					Cumulative total, 1944				
	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ohio	0	0	1	0	1	2	0	18	62	82
Indiana	0	0	0	2	2	4	0	0	24	28
Illinois	0	0	0	8	8	33	0	0	303	336
Kentucky	0	0	0	0	0	15	0	0	77	92
Michigan	0	0	0	4	4	12	0	4	222	238
Kansas	1	0	0	8	9	49	0	9	402	460
Neb., Mo., Iowa	0	0	0	0	0	1	0	0	15	16
Oklahoma	0	0	0	4	4	68	1	20	257	346
Texas:										
North Central	2	0	0	8	10	61	0	1	290	352
West	0	0	0	2	2	40	0	3	164	207
Panhandle	0	0	0	0	0	0	0	2	9	11
Eastern	1	0	0	1	2	6	0	5	114	125
Gulf Coast	1	0	0	3	4	33	12	14	211	270
Southwest	1	0	0	2	3	23	4	15	213	255
Total Texas	5	0	0	16	21	163	16	40	1,001	1,220
Louisiana:										
Northern	0	0	0	2	2	5	2	2	56	65
Southern	0	0	0	0	0	10	6	1	43	60
Total Louisiana	0	0	0	2	2	15	8	3	99	125
Arkansas	0	0	0	0	0	2	1	0	53	56
Mississippi	0	0	0	1	1	3	0	0	63	66
Ala., Ga., Florida	0	0	0	1	1	2	0	0	28	30
Montana	0	0	0	1	1	4	0	4	44	52
Wyoming	1	0	0	2	3	18	0	2	23	43
Colorado-Utah	0	0	0	0	0	3	0	1	25	29
New Mexico	0	0	0	0	0	7	0	3	50	60
California	1	0	0	3	4	7	0	8	171	186
Total United States	8	0	1	52	61	408	26	112	2,919	3,465
Total previous week	14	0	2	93	109					

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Drilling Contractors

Stuart Godfrey will drill the W. H. Clock 1 W. Wood, in SE NE SE 23-1s-16w, Van Buren County, Michigan.

Lupher Drilling Co. is the contractor on the Sohio Petroleum Co. 1 A. Spencer, in C N½ NW SW 28-16n-6w, Isabella County, Michigan.

Ashby Drilling Co. will drill on contract the Michigan Consolidated Gas Co. 1 Anna Alderman et al, in C SE 11-15n-8w, Mecosta County, Michigan.

Ferguson & Shafter are contractors on the E. L. Bourrett and J. Bolema 1 Donald and Claudia Petrie, in NE SE SW 3-11n-16w, Muskegon County, Michigan.

Perry, Busk & Ormiston are the drilling contractors on the Carl E. Grimes 4 John Pelon, in SW NE NE 3-4n-15w, Allegan County, Michigan.

Goll, Graves & Mechling will drill three tests for Basin Oil Co. and Don Rayburn, in Arenac County, Michigan. The tests are the 2 Manuel Klenk, Comm., in NW SE NW 8-19n-4e; the 2 Jadwiga Panasink, in SE SE SW 9-19-4e, and the 1 Joseph Sherman, in SE NE NW 9-19n-4e.

Robert W. Atha has been awarded contract to drill the Gulf Refining Co. 1 Thomas F. Marston "C," in C S½ SE NE 1-14n-4e, Bay County, Michigan. Same contractor will drill the H. L. Wadsworth and H. M. McClure 1 Clay H. Wislon, in SW SW SW 5-9n-6w, Montcalm County, Michigan.

J. E. Trigg, drilling contractor of Oklahoma City, has been awarded the contract to drill the Sinclair Prairie Oil Co. 1 Rott, a new wildcat start in NW SE SE 1-14n-9w, Canadian County, Oklahoma. Rotary was being rigged up.

W. B. Campbell Co., Great Bend, Kans., is the contractor on the W. P. Faulkner 1 Gates, in SW SW NW 3-22-13w, Stafford County, Kansas, which was rigging up. Campbell also has the contract on the W. P. Faulkner 1 Hullman, in NE NW NE 11-22-13w, where a good show of oil was found in the Arbuckle at 3,740 ft. Total depth of the test was 3,748 ft. and pipe has been set.

Newell & Chandler, of Calgary and Taber, Alta., are drilling below 4,400 ft. on Mid-Continent-Universal 1, a test of the Devonian limestone in the Taber field. Drilled originally by Mid-Continent Oil & Gas, the test for 15,000,000 cu. ft. of

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UNIBOLT Couplings with their three interlocking shelves, or 3-point suspension, employ a proven principle and thus assure equal distribution of pressure on the seal ring.

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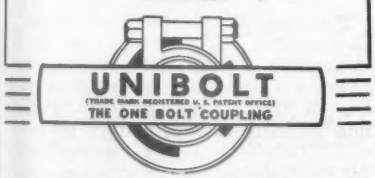

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TUBBS CORDAGE CO.
SAN FRANCISCO

gas in the upper Taber sand, and deepening to the Devonian, is sponsored jointly by Imperial Oil, California Standard, Alberta Petroleum Operators, Pacific Petroleum, Mid-Continent and Universal Petroleums.

Fillmore Drilling Co. has been organized by Ray Reese and Ray Price with offices in Fillmore, Calif., to engage in contract drilling and will soon start its first drilling project.

General Petroleums, of Calgary, Alta., has contract for a new well for Bata Petroleums near Unity, Saskatchewan, and is moving a rig from its own recently completed well in the Lloydminster field. It is finishing wells for Great Bend Oils at Marwayne and Vermilion.

Delta Drilling Co., Tyler, Tex., has been awarded drilling contract on the Sinclair Prairie Oil Co. 1 D. D. Shofner, in the W. Dickerson Survey, in the Chapel Hill field of Smith County, Texas. The test will be drilled to 13,000 ft. Heretofore, no test has been taken below the 9,000-ft. depth in the field.

Newell & Chandler, of Calgary, Alta., recently spudded an exploratory test for Empire Petroleums in LSD 7, 11-19-11w4, in the Steveville-Princess field, 125 miles southeast of Calgary. The well is to test the Devonian limestone, expected around 3,900 ft.

C. H. Withers and **C. E. Mills** are finishing National-Grant 1, LSD 4, 14-49-28w3, in the Lloydminster field, western Saskatchewan, with indications that it will be the first commercial oil well in that province. Test spudded at 9 a.m. on a Tuesday and cored the oil sand at 1,880 ft. at 5 p.m. the following Sunday, or 5 days 8 hours elapsed time.

Loffland Brothers Drilling Co. has the contract to drill the Cities Service Oil Co. 1 Lawson, in C SW NW 22-5n-4w, north of Lindsay, in the extreme southwest corner of McClain County, Oklahoma. Phillips Petroleum Co. and Mid-Continent Petroleum Corp. are supporting the test. Loffland will move a heavy-duty rig from the South Moore field immediately.

CALENDAR

December

Interstate Oil Compact Commission, quarterly meeting, Jackson, Miss., December 15-16.

April 1945

I.P.A.A., midyear directors meeting, New Orleans, La., April 9, 10 and 11.

October 1945

I.P.A.A., annual membership meeting, convention city to be selected later, October 15, 16 and 17.

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DEVIL DOG No. 3

for WAR and for VICTORY

No. 3 Devil Dog A. P. I. 3

Jeffrey contributes 65 years of chain-building experience to make oil well chain a dependable adjunct to the national war effort.

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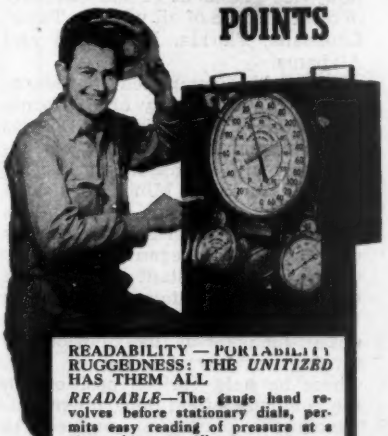

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READABLE—The gauge hand revolves before stationary dials, permits easy reading of pressure at a glance from any distance.

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REED ROLLER BIT CO., HOUSTON, TEXAS

PERSONALS

Directs Operations For Union Oil in Five States

SAM GRINSFELDER, who first became associated with Union Oil Co. on December 22, 1922, and who has had varied experience with the company's production and exploration operations since that time, is now vice president of the company in direct charge of all work in Texas, Louisiana, Florida, Mississippi and Alabama.

Grinsfelder completed his education at the University of California at Berkeley, graduating in 1921 as a mining engineer. Before his association with Union, he worked for the U.S. Bureau of Mines for a short period and also in one or two mines in northern California. His service with Union Oil began with an assignment as assistant geologist of the Rocky Mountain division. In 1927, he was sent to Texas as assistant manager of that division, returning to Los Angeles in 1931, where he held various positions in the company's field department, advancing to petroleum engineer in 1938.

On June 5, 1939, Grinsfelder returned to Texas as manager of field operations, which job was later expanded to cover the company's important Gulf Coast division in 1943. He is a member of the A.I.M.E. and A.A.P.G. and has prepared and delivered technical papers for both organizations. He was one of the earliest to recognize the value of the formation tester and used it in development work at Keeran, Tex., where Union was developing the Keeran ranch.

Whitney Weinrich has resigned from the refining division of Petroleum Administration for War to join the research department of Phillips Petroleum Co. at Bartlesville, Okla., in its engineering and development division. Before going to Washington Weinrich was associated with Gulf Research & Development Co. in Pittsburgh, heading the chemical engineering and process laboratories.

L. F. McCollum, coordinator of oil-production operations of Standard Oil Co. (New Jersey) and an official of subsidiary companies, has returned to New York, after spending several days in Tulsa and other Mid-Continent points. McCollum formerly was president of The Carter Oil Co.

Harold F. Sheets, New York, has been appointed to the petroleum industries foreign operations committee of Petroleum Administration for War, filling the vacancy caused by the death of John A. Brown.

OTIS COLE

Otis O. Cole, vice president of South Penn Oil Co., has been elected president of South Penn Natural Gas Co., its West Virginia subsidiary, succeeding the late Noel Robinson. Cole, a graduate of University of North Carolina, joined South Penn in 1911 and was assigned to engineering and geological work. He was chief engineer and chief geologist for South Penn for many years, and he will hold those posts, in addition to the presidency, in the West Virginia company.

Charles S. Jones, president of Richfield Oil Corp., and **A. C. Rubel,** vice president of Union Oil Co. of California, representing various oil groups, received recently U. S. Coast Guard Security Shields of Honor as a special award for facilitating the uninterrupted flow of war materials and for protection of oil installations in the Los Angeles Harbor-Long Beach Harbor area. The awards were presented by **Capt. George B. Gelly,** captain of the port. Jones is chairman of the supply and transportation committee for District 5, and Rubel is chairman of the California Oil Industry Protection Committee.

H. C. Wiess, president of Humble Oil & Refining Co., was elected last week to the board of trustees of Rice Institute, Houston. Wiess, a native Texan, is a graduate of Princeton University.

R. E. Dansby, formerly mud engineer for Stanolind Oil & Gas Co. in the Gulf Coast area, has established an office in Houston as a consultant in drilling-mud engineering and field service.

Glenn H. Bowes, Continental Oil Co., was elected president of the Southern California section, American Association of Petroleum Geologists, at its recent annual meeting. **Robert T. White,** Barnsdall Oil Co., was chosen vice president, and **Vincent W. Vandiver,** Seaboard Oil Corp., secretary-treasurer.

Sydney Bert Fowler is now the scout representing Stanolind Oil Purchasing Co. in West Texas. He is located at Midland and replaces **Troy Stalls,** who will be in the Stanolind Oil & Gas Co. land department at Wichita, Kans.

Freeman W. Burford, of Dallas, independent oil operator in East Texas and Arkansas fields when he entered war service, is now a member of the general staff in Paris and recently was promoted to colonel. Before engaging in business for himself Colonel Burford was employed by Skelly Oil Co.

Homer Lynn, former scout for Magnolia Petroleum Co. and later in the company's land department in Dallas, has become an independent operator at Jackson, Miss.

George R. Lord, formerly refineries manager for Sinclair Refining Co., was elected vice president last week, succeeding **George R. Taber, Jr.,** recently advanced to president. **John W. Duckett** was named refineries manager to succeed Lord. **R. J. Black** was appointed assistant refineries manager. His office will remain in East Chicago and he will supervise operations of the East Chi-

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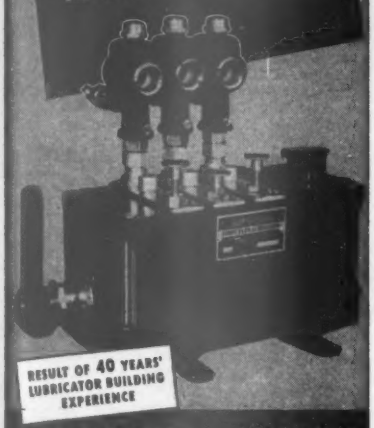
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For Pipe, Fittings and Flanges
The JAWS have straight teeth for pipe, and V shaped teeth for fittings. Drop-forged from special high carbon steel carefully milled, heat-treated and hardened for toughness and lasting qualities.
The HANDLES are forged from spring steel heat-treated to give the required stiffness.
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Write for catalog C-39a for complete showing and description of "Armstrong Bros." Pipe Tools.
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The Tool Holder People
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cago, Kansas City, Coffeyville and Sand Springs refineries. **R. G. Arner** was appointed superintendent of the East Chicago refinery and **W. V. Ischie** assistant superintendent.

Tom L. Williams, Jr., assistant secretary-treasurer and accountant for Cardinal Oil Co., San Angelo, Tex., has been promoted to general manager. **Harold E. Tips,** formerly with Eppenauer Drilling Co. at San Angelo, Fort Worth and Pecos, succeeds Williams.

J. Barton Hutchins, assistant to the executive vice president of Oil Producers Agency of California, with offices in Los Angeles, was married recently to **Miss Delphine Wood.**

Joseph E. Flacy, head roustabout for Shell Oil Co., Inc., at Bakersfield, Calif., in the San Joaquin division, has been promoted to foreman of construction and maintenance, in the same division.

Lyle W. Knight, who was assistant regional office manager in Chicago for Cities Service Oil Co., has been promoted to manager of the Cleveland regional office. **William W. King,** formerly in the Kansas City office, has taken Knight's place in Chicago.

Geoffrey F. F. Jones, assistant general manager of Trinidad Oil Fields, is en route to London for a short stay. **Capt. J. A. Goodwin,** M.C., managing director of Trinidad Consolidated Oilfields, Ltd., has been in London, where he attended the annual meeting of his company.

Gertrude M. Drach has taken a position as geologist with the exploration division, producing department, Standard Oil Co. (N.J.), New York. Miss Drach had served with Petroleum Administration for War in Washington since August 1941, first on E. DeGolyer's personal staff, later in the program planning division.

Paul Stock, Cody, has been elected president of Rocky Mountain Oil & Gas Association to succeed **B. B. Brooks,** resigned. **James Donoghue,** Denver, was elected first vice president; **A. B. Cobb,** Great Falls, second vice president. It was decided to open a full-time office in Casper with a secretary in charge.

F. W. Williams, formerly assistant secretary of the residential gas section of American Gas Association, has been advanced to secretary. He succeeds **John W. West, Jr.,** who as assistant managing director, will continue his present administrative responsibilities in connection with the operation of the section. Williams joined the association staff in 1937.

ORBIT
DRILLING VALVES ARE QUICK OPENING
ONLY 2½ to 5 TURNS ARE REQUIRED TO FULLY OPEN OR CLOSE THE ORBIT DRILLING VALVE. THE SEATS ARE PROTECTED AGAINST DAMAGE FROM DRILLING TOOLS AND WIRE LINES.

Orbit Flanged End Drilling Valve
ORBIT DRILLING VALVES ARE AVAILABLE IN BOTH FULL OPENING AND NOMINAL OPENING SIZES. WITH FLANGED OR SCREWED ENDS.
See pages 2194 to 2211 in 1944 Composite Catalog
ORBIT VALVES
OIL WELL IMPROVEMENTS CO.
Tulsa, Oklahoma

Industrial Items

Payte Purchases Interest In Empire Company

D. F. Payte, of Empire Oil Field Machinery Co., announces the purchase of B. R. Schabarum's interest in the company, which operates a specialized machine shop and store at Odessa, Tex., distributing nationally known oil-field equipment.

This company will continue to operate under the firm name of Empire Oil Field Machinery Co., under the management of Payte. A. C. (Art) Evans is in charge of sales offices which have been established in the McBurney Building, Tulsa.

Daniel Orifice Fitting Co. Opens Tulsa Office

Daniel Orifice Fitting Co., Los Angeles, has opened offices in Tulsa at 310 Thompson Building which will serve the Mid-Continent area. The office is under the supervision of F. N. Davis.

Graves, Dowell District Manager, Addresses Tulsa Nomads

Roy Graves, district manager of Dowell, Incorporated, at Calgary, Alberta, Canada, was the principal speaker at the November 27 luncheon of the Tulsa Nomads. He discussed oil developments in the prairie provinces of Canada south of Edmonton. He explained the results to date of the extensive exploratory program under way in that area. Jack Walton, president of the Tulsa Nomads, presided.

Owens Made Elliott Vice President

Election of R. W. Owens as vice president in charge of manufacturing at Elliott Co., Jeannette, Pa., is announced by Grant B. Shipley, president. Owens joined Elliott as assistant to the president in February 1944, having previously had a wide experience of some 28 years in the design and manufacture of electrical products.

Frank H. Stohr has been appointed assistant to the president, coming to his new position from Westinghouse Electric & Manufacturing Co., where he was manager of the industry sales department.

Porter Appoints Failmezger Sales Manager of Quimby Pump

H. K. Porter Co., Inc., of Pittsburgh, Pa., has appointed Victor Failmezger, previously application and field engineer for the company, to the position of sales manager of its subsidiary, Quimby Pump Co., of Newark and New Brunswick, N. J. During the past year, Failmezger has represented Porter and its subsidiaries in western Pennsylvania, West Virginia, and eastern Ohio.

Schaeffer Becomes Active President of Duralmetallic Corp.

Samuel A. Schaeffer has joined Duralmetallic Corp., Kalamazoo, Mich., manufacturers of flexible metallic and plastic packings and mechanical sealing devices, as active president.

Schaeffer has been identified in the industrial field for many years as vice president and general superintendent of Clarage Fan Co. of Kalamazoo. Previously he was foundry superintendent of the Fairbanks-Morse Co. of Three Rivers, Mich. He has served as president and chairman of the board of directors of Durametallic Corp. for many years.

Oil Center Celebrates Largest Christmas Tree Manifold

Oil Center Tool Co., Houston, was host to a large group of oil company and equipment manufacturing officials November 3 to celebrate the successful testing of the world's first 15,000-lb.-test christmas tree manifold.

Heretofore, 10,000-lb.-test equipment of this nature has been sufficient to cope with the pressures encountered thus far, but recent deep and extremely high-pressure discoveries indicate a need for surface control equipment capable of withstanding pressures in the 6,000-7,000-lb. pressure range with a required minimum safety factor of 2 to 1.

Dr. Gutzeit Appointed Research Director of General American Process Equipment

Dr. Gutzeit, D.Sc., has been appointed research director of General American Process Equipment, a division of the General American Transportation Corp.

In 1941, Dr. Gutzeit came to this country from Switzerland, where he held a professorship of complex chemistry and ore dressing at the University of Geneva, and became associated with the Dorr Company. In Europe, he also acted as consultant to a number of governments and private industries on chemical and metallurgical problems.

Light Weight Electrode Holder

A new 22-oz. holder for welding electrodes has been announced by Lincoln Electric Co., Cleveland. Having a current rating of 300 amp. with ample capacity for overload, the new holder will handle various sizes of electrodes ranging from $\frac{1}{16}$-in. diameter to $\frac{1}{4}$-in. diameter inclusive.

Features of this electrode holder include: Hollow, air-cooled, heat-resisting fiber handle, excellent balance and equally good performance on both alternating and direct current. The holder is designed to hold the electrode securely at any angle yet permit quick and easy change of rods.

Industrial Supply Co. Opens Office in Dallas

Industrial Supply Co., Wichita Falls, has opened a district sales office at 1015 Kirby Building, Dallas, with Barney McMullen in charge. McMullen was district manager for Republic Supply Co. for more than 15 years in North Texas, Oklahoma and Louisiana, and for the past year has represented Byron Jackson Co. in West Texas.

Dresser Manufacturing Co. Changes Corporate Name

Dresser Manufacturing Co., of Bradford, Pa., makers of flexible pipe couplings and other pipe-line products since 1880, has changed its name to Dresser Manufacturing Division of Dresser Industries, Inc., H. P. Boncher, general manager, announces.

This change of name distinguishes Dresser Manufacturing Division and its Bradford operations from the parent organization, Dresser Industries, Inc. It will not affect personnel, products, or development program of the division.

Trade Literature

D. W. Haering & Co., Inc., 205 West Wacker Drive, Chicago.—September issue of H-O-H Lighthouse, company's house organ, which contains an article giving the result of tests by a major railroad on diesel-engine cooling-water treatment, and an article on scale and corrosion control in engine jacket cooling systems.

Classified Advertising

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GRADUATE chemical or mechanical engineers with plant operation experience in a war essential industry as supervisors. Central southeast location. Men with petroleum refining experience particularly desirable. Excellent peacetime prospects. Employment under rules of WMC carries highest priority. Good living conditions. Salary $260 to $345 per month for 48-hour shift week. Box A-259, The Oil and Gas Journal, Tulsa, Okla.

THE Eastman Oil Well Survey Company has a Field Sales and Service position open in the Texas Gulf Coast area. Applicant must have good knowledge of and be well acquainted in the oil well drilling industry in this area. Attractive salary. Expenses and car furnished. Please mail written application to Post Office Box 3128, Houston 4, Texas.

WANTED by consulting organization: Petroleum engineers with Hayward mud logging experience or its equivalent. Immediate openings in Venezuela, excellent opportunity for advancement to managerial positions throughout the world. Box A-290, The Oil and Gas Journal, Tulsa, Okla.

HELP WANTED

WANTED: MECHANICAL ENGINEER who knows something about drafting. John Zink Company, 4401 South Peoria, Tulsa, Oklahoma.

WANTED, by large independent oil operator, experienced production superintendent between 30-35 years old, familiar with gas, gas distillate, and oil wells, including dual completions, workovers, squeezing, packer work, etc. Experience with gas, distillate and oil separation problems preferred. Would prefer man with engineering training, but not necessarily a degree. Box A-297, The Oil and Gas Journal, Tulsa, Okla.

ENGINEER or Physicist to engage in study of reservoir performance as related to physical properties with major oil company. Individual should have aptitude and background to enable the mastering of mathematical analysis of problems in flow of fluids. Position offers good future. Give full personal data, experience and salary desired. Our employes know of this advertisement. All answers strictly confidential. Box A-275, The Oil and Gas Journal, Tulsa, Okla.